NEXTGEN: LEVERAGING PUBLIC, PRIVATE, AND ACADEMIC RESOURCES

(112–60)

HEARING

BEFORE THE

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November 4, 2011

MEMORANDUM

TO: Members, Committee on Transportation and Infrastructure

FROM: The Honorable John L. Mica, Chairman

SUBJECT: Hearing on NextGen: Leveraging Public, Private and Academic Resources

Monday, November 7, 2011, 10:00 a.m. in the Willie Miller Instructional Center
Auditorium, Room 101
Embry-Riddle Aeronautical University
600 S. Clyde Morris Boulevard
Daytona Beach, Florida 32114

PURPOSE

The Committee on Transportation and Infrastructure will meet at the Federal Aviation Administration's Florida NextGen Test Bed in Daytona Beach, Florida, to receive testimony from federal government and industry witnesses regarding the Federal Aviation Administration's (FAA) NextGen Test Beds and the agency's efforts to leverage public, private and academic resources to deliver NextGen benefits.

BACKGROUND

NextGen: A Transformation of the National Airspace System:

The present-day national airspace system (NAS) consists of a network of en route[1] airways, much like an interstate highway grid in the skies. Airways are routes in space between

[1] The Federal Aviation Administration (FAA) uses three types of facilities to control traffic: *Airport towers* control airport surfaces and the airspace immediately surrounding airports; *Terminal Radar Approach Control Facilities (TRACONs)* sequence and separate aircraft in terminal airspace – i.e., as they approach and leave airports, beginning about five nautical miles and ending about 50 nautical miles from the airport and generally up to 10,000 to 14,000

fixed points that include navigational radio beacons and waypoints defined by latitude and longitude coordinates and unique names. Because aircraft operating at high altitudes must follow these airways, they often cannot fly the most direct routing from their departure points to their destinations.

Surveillance and separation of aircraft is largely provided by an extensive network of radar sites and air traffic controllers who are directly responsible for ensuring adequate separation between aircraft receiving radar services. Maintaining this separation is achieved through extensive use of voice communications between controllers and pilots over open two-way radio frequencies, not so different from the technologies used during World War II.

Under the current system, controller workload, radio frequency voice-communication congestion, limitations of air traffic control (ATC) radar accuracy, and the coverage and accuracy of ground-based navigational signals impose practical limitations on the capacity and throughput of aircraft in the system. This is particularly true in busy terminal areas near major airports and around choke-points where many flight paths converge.

Currently, the U.S. air transportation system transports about 730 million passengers a year and, combined with general aviation activity, results in about 70,000 flights over a 24-hour period.[2] The FAA predicts that, by 2025, increases in passengers (up 53 percent to 1.1 billion per year) and general aviation activity will result in air traffic increasing to more than 85,000 flights every 24 hours.[3] It is widely acknowledged that the current U.S. air transportation system will not be able to meet these air traffic demands. In 2003, Congress passed H.R. 2115, Vision 100 – the Century of Aviation Reauthorization Act (Vision 100) (P.L. 108-176), which created the Joint Planning and Development Office (JPDO) within the FAA, and tasked it to plan for and coordinate with Federal and non-federal stakeholders the transformation from the current air traffic control system to the NextGen system to meet anticipated traffic demands of 2025.[4]

The NextGen plan consists of new concepts and capabilities for air traffic management and communications, navigations, and surveillance that involves: transitioning from a ground-based radar system to a more automated, aircraft-centered, satellite-based surveillance system; developing more direct and efficient routes through the airspace; improving aviation weather systems; developing data communications capabilities between aircraft and the ground to reduce controller and pilot workload per aircraft; and creating shared and distributed information technology architectures.

To date, the FAA has focused its effort to implement NextGen on deploying seven core infrastructure programs: Automatic Dependent Surveillance – Broadcast (ADS-B); System Wide Information Management (SWIM); NextGen Networked Enabled Weather (NNEW); Data

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feet above the ground; and *Air route traffic control centers* control aircraft in high-altitude en route airspace – i.e., in transit and during approaches to some airports, generally controlling the airspace around and above terminal areas.

[2] FAA email to Aviation Subcommittee Staff, 9-29-11

[3] Ibid.

[4] Public Law 108-176, Section 709.

Communications; NAS Voice Switch (NVS); En Route Automation Modernization (ERAM); and Collaborative Air Traffic Management Technologies (CATMT).[5]

According to the FAA, there are significant, quantifiable benefits associated with the proper implementation of NextGen. FAA estimates show that by 2018, NextGen air traffic management improvements will reduce total delays, in flight and on the ground, about 35 percent, depending on fuel prices and traffic, compared with what would happen if no NextGen program was pursued.[6] The delay reduction will provide $23 billion in cumulative benefits from 2010 through 2018 to aircraft operators, the traveling public and the FAA.[7] With the airspace management improvements planned from 2010 forward, the FAA estimates that airspace users could save about 1.4 billion gallons of aviation fuel during this period, cutting carbon dioxide emissions by 14 million tons.[8] As new avionics are approved for installation in aircraft, the purchase and installation of the NextGen avionics will also drive job growth in the U.S. aviation sector. With as much as $41 billion in total costs to the U.S. economy annually, NextGen has a significant benefit to the broader economy in reduction of delay.[9]

NextGen TestBeds

The NextGen enterprise is made up of several core transformational programs, as well as a myriad of FAA designated NextGen Solution Sets. With both the transformational programs and the NextGen solution sets, the FAA has and will continue to pursue acquisitions of technologies to deliver NextGen benefits.

The NextGen Test Beds provide a forum for industry to test concepts and specific technologies for NextGen acquisitions in an operational environment to gather data and demonstrate benefits before moving into the formal acquisition process. The Test Beds are strategically located to take advantage of in-house expertise at the three locations, and leverage the public, private, and academic resources to develop systems for acquisitions that will deliver tested and proven NextGen benefits.

The NextGen Test Beds serve also as a means for leveraging industry and government resources. The Government Accountability Office reported on the importance of collaboration with industry and NextGen partner agencies for the efficient delivery of NextGen benefits.[10] The GAO cites FAA's assertions that private sector involvement in the research efforts for NextGen has the potential to save a significant amount of time and funding necessary to deliver NextGen benefits.[11] Given the tight budgetary conditions of the federal government, the tech transfer efforts underway at NextGen Test Beds are designed to leverage private sector, academic, and

[5] *ATC Modernization and NextGen: Near-Term Achievable Goals,* Before the H. Comm. on Transportation and Infrastructure, 111th Cong. vii-xx (2009).
[6] http://www.faa.gov/nextgen/benefits/
[7] Ibid.
[8] Ibid.
[9] "Your Flight Has Been Delayed Again", A report by the Joint Economic Committee, United States Congress, May 2008.
[10] GAO-11-604, *NextGen Technology Transfer,* June 30, 2011.
[11] GAO-11-604, *NextGen Technology Transfer,* June 30, 2011, p. 27.

NextGen partner agency resources. Test beds also serve as a way to draw industry participation in the fielding of NextGen technologies. According to the GAO, "some NextGen test facilities serve as a forum in which private companies may learn and partner with each other, and eventually, enter inter-technology acquisition agreements with the FAA with reduced risk."[12]

The FAA currently operates three NextGen Test Beds. They are located in Daytona Beach, Florida; Atlantic City, New Jersey; and Dallas, Texas.

Florida NextGen Test Bed

The FAA's Florida NextGen Test Bed is a facility operated under contract with Embry-Riddle Aeronautical University and industry partners.[13] The Test Bed includes a research and demonstration facility at the Daytona Beach International Airport (DAB) in Florida. According to Embry-Riddle, "the Test Bed will be used to integrate and demonstrate new and emerging technologies into existing and planned enhancements for the NAS."[14] The Test Bed operates under FAA governance and draws upon the expertise of the FAA, Embry-Riddle Aeronautical University, and industry partners.[15]

According to the FAA, the initial success of NextGen integrated testing at Daytona Beach International Airport as well as a continuing need for proof of concept demonstrations prompted the FAA to ensure long-term sustainability for the Test Bed, beginning in fiscal year 2009. The Test Bed draws funding from the NextGen Facilities and Equipment account for the construction and maintenance of the facility, but the FAA points out that industry and academic partners make in-kind contributions (including time, equipment and materials, space and services) that make the Test Bed possible. Industry partners bring their technologies to the site for testing and Embry Riddle provides the engineering and programmatic expertise at the Test Bed. The FAA governs the activities of the Test Bed, and is currently developing mechanisms to bring demonstrations from concept to deployment in the NAS. The ribbon cutting on November 7, 2011 will mark the opening of the FAA-controlled Test Bed.[16]

The Test Bed is located at the International Terminal of the Daytona Beach International Airport. Because of the collocation of the Test Bed at Daytona Beach International Airport with Embry-Riddle Aeronautical University, the FAA will benefit from the testing carried out at a mixed use airport (both commercial and general aviation) with a sizable fleet of NextGen equipped Embry-Riddle aircraft. The ADS-B equipped Embry-Riddle fleet presents the ability to demonstrate all aspects of ADS-B in an operational environment. Specific features include:[17]

- State-wide coverage (surface to 60 k);
- Wide Area Multilateration (WAM) capability;

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[12] GAO-11-604, *NextGen Technology Transfer*, June 30, 2011, p. 26.
[13] FAA email to Subcommittee Staff, October 28, 2011.
[14] Florida NextGen Test Bed Highlights briefing, Embry Riddle Aeronautical University, October 2011.
[15] Ibid.
[16] FAA email to Subcommittee Staff, October 28, 2011.
[17] Florida NextGen Test Bed Highlights briefing, Embry Riddle Aeronautical University, October 2011.

- Ground-Based Augmentation Systems (GBAS) capability;
- Airport Surface Detection Equipment Model-X (ASDE-X);
- Airport (DAB) surface coverage;
- Remote access to additional ADS-B data (i.e., Gulf of Mexico (GoMex)); and
- Universal Access Transceiver (UAT) equipped aircraft (allows Traffic Information Service-Broadcast (TIS-B) and Flight Information Service-Broadcast (FIS-B) testing).

The Florida NextGen Test Bed consists of three separate areas: the Core area, the Integration Suite and the Demonstration Suite. The Core Area consists of the entryway, central passageway, and utilities and data center room where computer systems needed to drive the capabilities of the Test Bed are housed. The Integration Suite provides office space and collaborative environments where industry engineers and University experts will develop concepts for testing in the operational demonstration environment. The Demonstration Suite will be used to conduct the demonstrations of prototype NextGen technologies that have been developed at the Test Bed.

An important feature of the Florida NextGen Test Bed is the intended fluidity of the operations there. Industry partners will bring systems for testing and demonstration at the Test Bed, and where appropriate, the FAA will move some systems into the NAS. Systems not ready for deployment will be cleared so other systems might be tested. The Test Bed currently has partnerships with Embry-Riddle, the Daytona Beach Intl. Airport, GE, Lockheed Martin, Frequentis, UK NATS, Harris Corporation, The Boeing Company, Barco, Mosaic ATM, Ensco, Sensis, Jeppesen, CSC, the U.S. Department of Transportation's John A. Volpe National Transportation Systems Center, and the MITRE Corporation.[18] However, that list is likely to grow as Test Bed activities continue to develop.

New Jersey NextGen Test Bed

At the FAA's William J. Hughes Technical Center in Atlantic City, New Jersey, the FAA operates the NextGen Integration and Evaluation Capability (NEIC). The NIEC opened on January 28, 2010.[19] The New Jersey Test Bed allows concepts that have been developed, including concepts developed at the Florida NextGen Test Bed, to be tested in an environment of mixed legacy and NextGen technologies. According to the FAA, a particular strength of the NIEC is its high fidelity, real-time simulation capabilities which allow for the maturation of tested concepts and the beginning of the development of requirements definitions. Like the Florida Test Bed, the NIEC Test Bed intends to pursue partnerships with other federal agencies, industry and academia.[20]

Characteristics of the NIEC include:

[18] ERAU email to Subcommittee Staff, November 1, 2011.
[19] FAA briefing, *NextGen Test Bed Capabilities and Future Plans*, May 26, 2010.
[20] http://www.faa.gov/go/niec

- A collocated NIEC display area to support Human-in-the-Loop simulations;
- A real-time, rapid prototyping and simulation environment that simulates the NAS while integrating NextGen enabling components;
- Technical Center and external laboratory integration capabilities;
- Voice communications capabilities;
- Audio, video, and data recording capabilities; and
- The flexibility to support multiple concurrent studies.

Texas NextGen Test Bed

The FAA's Texas Test Bed is located at the NASA/FAA North Texas Research Station (NTX) at Dallas Fort Worth International Airport. The Texas Test Bed is a collaborative effort between NASA Ames Research Center and several FAA organizations, and supports NextGen research through field evaluations, shadow testing, simulation evaluations and data collection and analysis.

Consistent with NASA's aeronautics mission the NASA NTX has long served as a site for numerous air traffic management automation tool field evaluations including: Traffic Management Advisor (TMA) , Final Approach Spacing Tool (FAST) , Conflict Prediction and Trial Planning (CPTP), Collaborative Arrival Planning (CAP) and Direct-To (D2). In addition to conducting these large-scale field evaluations, the NTX team (NASA civil servants and contractors) has developed expertise in: airspace and surface operations analyses; ATC, air carrier and airport procedures; integrating research prototype systems into operational environments and the collection and analysis of quantitative and qualitative air transportation system data sets.[21]

The NTX is located in a 5,000 sq. ft. purpose-built laboratory collocated with the FAA's Fort Worth Air Route Traffic Control Center (ARTCC). The NTX team develops and manages research infrastructure at a variety of FAA, air carrier and airport operational facilities, embedding assets in a rich and varied air traffic environment. For example, the Dallas Fort Worth International Airport features two air traffic control towers and a central airport traffic control tower that can support Test Bed activities. In addition, the Dallas Terminal Radar Approach Control (TRACON) facility is within five miles of the NTX base. In addition, the airline operation centers of Southwest Airlines, American Airlines, and American Eagle are nearby the NTX facility.[22]

[21] *NTX Research Notebook*, March 2011, page 2.
[22] *NTX Research Notebook*, March 2011, page 2-3.

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Witnesses:

The Honorable J. Randolph "Randy" Babbitt
Administrator
Federal Aviation Administration

Dr. John P. Johnson
President
Embry-Riddle Aeronautical University

Dr. Gerald L. Dillingham
Director, Physical Infrastructure Division
Government Accountability Office

The Honorable Marion C. Blakey
President and Chief Executive Officer
Aerospace Industries Association

Mr. Peter Bunce
President and Chief Executive Officer
General Aviation Manufactures Association

Mr. Alan Caslavka
Vice President – Avionics
GE Aviation

NEXTGEN: LEVERAGING PUBLIC, PRIVATE, AND ACADEMIC RESOURCES

MONDAY, NOVEMBER 7, 2011

HOUSE OF REPRESENTATIVES,
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE,
WASHINGTON, DC.

The committee met, pursuant to call, at 10:02 a.m., in Room 101 of the Willie Miller Instructional Center Auditorium, Embry-Riddle Aeronautical University, 600 S. Clyde Morris Boulevard, Daytona Beach, Florida, Hon. John L. Mica (Chairman of the committee) presiding.

Mr. MICA. I would like to call this hearing of the House Transportation and Infrastructure Committee to order. Today we have a field hearing here in Daytona Beach, Florida. I thank Members for attending and our witnesses for being with us, and we will get to some introductions in just a minute.

But we are pleased that this probably one of the first congressional hearings I believe we have held at Embry-Riddle. We are delighted to have them host us. We are going to hear from Dr. Johnson, one of our witnesses, in a few minutes. But thank you for your hospitality and allowing us to come here, particularly when Congress' reputation lately—to host us and have us as your guests.

But this is an important hearing, and the title of it deals with, of course, our next generation air traffic control systems. And the title is "Leveraging Public, Private, and Academic Resources."

Today's hearing is being held in conjunction with a ribbon cutting, which will be really open expansion of a next generation air traffic control Test Bed facility, and the public is invited to that, I believe, at 2:00 today. It is just next to the airport terminal facing the airport terminal that is on the left. And that will begin promptly at 2:00 today.

I want to welcome again our Members of Congress. We are joined today by the chairman of the House Aviation Subcommittee. Mr. Petri, the gentleman from Wisconsin, chairs the subcommittee. We have another chair of one of our subcommittees, the distinguished gentleman from Pennsylvania, Mr. Bill Shuster, who chairs the—I always say the railway—the Rail Subcommittee, but it is Rails, Pipelines, and Hazardous Materials—did I get it wrong—including responsibility in both the committee and in Congress.

We are pleased also to be joined by another Transportation Committee member, the gentleman from Texas. He is part of that powerful group of 89 freshmen. We have 19 Republican freshmen on this committee, and he is one of our new members, Blake

Farenthold from the State of Texas. And we are pleased to have him join us today.

And we are also pleased to have minority counsel. Thank you so much for joining us and being with us today. We have the staff director also as part of our committee staff with us. So, that is the makeup of our panel. We have got Mary acting as counsel for me this morning—welcome, Mark—of the majority staff.

On the panel of witnesses, first of all, I have to welcome probably one of the most important people in aviation in the United States and a great leader, who helped us move in some difficult times under some difficult circumstances in aviation policy and programs, Randy Babbitt, who is the Administrator. We are pleased to have Dr. Johnson, who is the president here of the Embry-Riddle University. General Johnson does a great job of leading the premiere aeronautical institute and university not only in the United States, but the world. And we are pleased to have, again, you host us here today.

We have got Gerald Dillingham. He's from the General Accountability Office, GAO, as we affectionately refer to them. They have testified many times before our committee, and they do an outstanding job on oversight, some investigations, and give an important view of Federal programs. We are pleased to have you with us.

Then, we are going to talk about a top hitting panel of witnesses. We have probably one of the finest FAA administrators following the footsteps of Marion Blakey, who served. I had the honor to be chair of the Aviation Subcommittee. She is actually one of the people who helped us launch some of the NextGen effort, and she now is the president and CEO for Aerospace Industries. I welcome the former Secretary and current president and CEO, Marion Blakey.

And then, another distinguished gentleman that represents one of the most important aspects of aviation, and actually people who use and be involved in all of the next generation, use software and systems to develop them, we have the president and CEO, Pete Bunce. And Pete Bunce, he is with the General Aviation Manufacturers. He is on the end.

And then I am going to blow it, Alan Caslavka?

Mr. CASLAVKA. Caslavka.

Mr. MICA. Good. A fellow Czechoslovakian surname. Most people think Mica is Italian, but it is also Czechoslovakian. But he is vice president of avionics at GE Aviation, and we are honored to have him here.

The order of this will be as follows. I have an opening statement, and then I will refer to Members for opening statements, and then I will go to our witnesses. Normally we have 5 minutes; we would prefer it. I have read most of your testimony already. If you condense some of it [inaudible]. But with that, I will recognize myself, and then I will turn it over to Members, and then we will [inaudible]. Again, welcome.

But I think today is a very important day because the people who are on this panel and Members of Congress I am sitting beside, and that is pretty decisive because I do not intend for there to be another short-term extension of our FAA bill. I happened to be chair in 2002. I headed that office from close to a year 2000 and

then as chairman of aviation, to pass a 4-year bill that expired in 2007 passed in 2002. So, for more than 4½ years now, we have not had a long-term FAA reauthorization. As some of you know, we are very frustrated by this. I agreed when the [inaudible], and since February when I became the chair, there were three more, and I am the fourth one, and I said that we have got to be the last. We did have sort of a showdown, FAA and Congress, on the matter, and through that I believe we will now have a long-term bill.

We will have it on the President's desk before Christmas and certainly before January 31st. So, that is why this hearing is particularly important because one of the most important components for the bill is the conditions we have for next generation aircraft. We did some things in the last legislation, which is 4½ years old now, and it is overdue for updating the policy.

The bill that we propose does some things, but I think that we need the proper [inaudible] some of it, witnesses just before we started. We want to hear anything about these new provisions to alter, to improve to [inaudible] some dysfunction that works best [inaudible]. This is not my work or Members' work, but [inaudible] hopefully can move us forward [inaudible] plan.

Specifically, the legislation currently [inaudible] the NextGen technology to include accountability and management for modernization, that sets immediate performance methods, which we are hopeful hold FAA accountable for [inaudible] and be responsible for, again, putting all this together.

It sets a deadline for the deployment of NextGen [inaudible] administrator to utilize private sector and FCC to accelerate the deployment of NextGen technology, and also flight plans. Furthermore, to streamline we have a certification process for NextGen technology, and for flight paths. It sets a rulemaking deadline for offering more beneficial ADS–B, and it also directs FAA to leverage private sector capital to accelerate the NextGen [inaudible].

It provides a process for the timing for the acceleration of FAA facilities so NextGens are enabled. That is also important. And, finally, it provides [inaudible] safe integration of our unmanned aviation systems into the National Airspace System.

So, we came here to hear from you today to begin to assess where we are, where we must go, and how we must get there at a very pivotal time when the Congress [inaudible] legislation [inaudible].

Also, at the conclusion of today's hearing at 2:00, as you know, there will be an opening of the Test Bed. [Inaudible] that we have and we will know about the progress of that particular enterprise today and the other [inaudible] their mission.

But the key to all this I think was summed up in a summary that I read [inaudible]. It says that the FAA has said that there are significant quantifiable benefits associated with proper implementation of NextGen. FAA's estimates show that by 2018, next generation air traffic control management improvements will reduce total delays by about 35 percent. And also, they will have a dramatic impact on fuel prices and [inaudible] compared to what would happen if we have no [inaudible]. And the delay in the production will provide the benefit of $23 billion accumulated from

2010 to 2018 to aircraft operators [inaudible] project management areas.

So, getting back to airspace management improvements plan from 2010 forward, we can save about $1.4 billion of aviation fuel and carbon dioxide emissions, about 14 million tons. [Inaudible] aircraft. The first would be an installation of next generation avionics. It also drives job growth [inaudible] economic prosperity and high-paying employment, and hopefully this activity will alleviate the need to, again, [inaudible] some of the finest people we have in the industry who actually [inaudible] in the system, so the combination of that FAA [inaudible] and management, to administer the program.

And, finally, we could not have a better university or more well-qualified personnel here [inaudible] aviation and avionics than Embry-Riddle University.

So, we are pleased you could join us. I hope you can take some today to get some information on today's hearing, and [inaudible] done here and where we do go from here.

We have been joined by the Honorable Sandy Adams, and she and I have the privilege to represent [inaudible] community and representing [inaudible].

So, with that, let me yield first to Mr. Petri, chair of the House Aviation Subcommittee.

Mr. PETRI. Mr. Chairman, thank you very much for inviting us [inaudible] the involvement of non-profit private organizations and of industry [inaudible] technology [inaudible] aviation [inaudible] safety that it will provide for the expansion of the capacity of the system, for the efficiency that it will provide to the airline industry. The estimates are it will save some 15 to 25 percent of fuel as it goes forward, so it's green technology. And it is something that will maintain the leadership of our country for the foreseeable future in aviation if we proceed with it in a determined and orderly and well-organized way.

So, I thank your panelists and you for having this important hearing and Embry-Riddle for making a contribution to this national effort.

Mr. MICA. Thank you, Mr. Petri. We will yield to the chairman, Bill Shuster from Pennsylvania.

Mr. SHUSTER. Thank you, Mr. Chairman, and thank you for bringing us here to Florida for this very important hearing.

I just want to highlight the importance of public/private partnerships, and how that is what we have today, and we need to continue to look across the scope of the Government to find out ways to bring the private sector in and leverage the Federal taxpayer dollars with the private sector to be able to bring projects like this that are going to be very, very beneficial to the traveling public, to Congress of the United States. And so, it is great to be here, and thank you.

Mr. MICA. Thank you, Mr. Shuster. The gentleman from Texas, Mr. Farenthold.

Mr. FARENTHOLD. I would like to thank you all for your hospitality. It is good to be back in Florida also as a regular visitor on vacation. I am excited to be here and excited in the anticipation in watching the way that Government should operate working with

the private sector and academia to come up with the best solutions that in the long run will save both the Government and industry time and money.

I look forward to hearing from our panelists.

Mr. MICA. Thank you. And I would like to welcome to the panel—she is not a member of our committee, but I ask unanimous consent that we recognize her. Without objection, so ordered. And welcome, Representative Sandy Adams.

Ms. ADAMS. Thank you, Mr. Chairman. I am happy to be here, and I am looking forward to the discussion of NextGen. We have been talking about it for a long time now, and it is a good public/private partnership. I am just happy to be here, and I appreciate you allowing me to be here today.

Mr. MICA. And while we do not have a Democrat member of the committee with us today, and I have given permission for some of them to attend some other functions around the country, we do have counsel from the Democratic staff, Alex Burkett. And did you want to make any comment?

Mr. BURKETT. Mr. Chairman, I respectfully would not, other than just to thank you on behalf of the Democratic members for holding this hearing.

Mr. MICA. Thank you. And we have had wide bipartisan support for the legislation. Thank you for your participation. The important thing now is we get the job done, and I look forward to working with everyone in that regard.

So, I think we have covered our membership and those attending. The order of business will be now to hear from our panel of witnesses. And, again, we are delighted, and I thank you, too. Usually when I have the Administrator, he will sit on a panel, and we bring in red velvet carpeting, and we have a very special place for him. And I thank him for allowing us to have him join the entire panel, but we will recognize him first, thank him for his service, and actually just delighted to have his leadership in, again, working on this important issue, being here to report to us, and also see the Test Bed.

So, welcome, Mr. Administrator, and you are recognized.

TESTIMONIES OF HON. J. RANDOLPH BABBITT, ADMINISTRATOR, FEDERAL AVIATION ADMINISTRATION; GERALD L. DILLINGHAM, PH.D., DIRECTOR, PHYSICAL INFRASTRUCTURE ISSUES, GOVERNMENT ACCOUNTABILITY OFFICE; JOHN P. JOHNSON, PH.D., PRESIDENT, EMBRY-RIDDLE AERONAUTICAL UNIVERSITY; ALAN CASLAVKA, PRESIDENT, GE AVIATION SYSTEMS-AVIONICS; HON. MARION C. BLAKEY, PRESIDENT AND CHIEF EXECUTIVE OFFICER, AEROSPACE INDUSTRIES ASSOCIATION; AND PETER J. BUNCE, PRESIDENT AND CHIEF EXECUTIVE OFFICER, GENERAL AVIATION MANUFACTURERS ASSOCIATION

Mr. BABBITT. Thank you, sir. Thank you, Chairman Mica, Congressman Petri, members of the committee. Thank you all for the opportunity to come here today to highlight the capabilities of the Florida Test Bed.

Mr. MICA. Can you all hear him? Move that up a little bit. We do not want to miss a word, Randy.

Mr. BABBITT. That concludes my remarks.

[Laughter.]

Mr. BABBITT. Thank you very much for the opportunity to come and speak with you about the Florida Test Bed and the things that we are undertaking here. It is an exciting expansion of the Federal Aviation Administration's NextGen testing operation.

I am pleased to be able to join you all here in Florida. I grew up here, so it is nice to be back. And as I was explaining to Dr. Johnson, I actually learned to fly at Embry-Riddle, so it is a little humbling for me to come back here.

The FAA's three NextGen Test Beds here in Florida, in Atlantic City, and in North Texas provide an opportunity for real world testing for us, demonstration environments that facilitate both research and development, as well as real world demonstrations and evaluations. They offer us a variety of resources that offer us ways to develop NextGen technologies, along with the concepts and various implementation techniques that we need.

And today, we are marking the completion of renovations and enhancements here at the Florida Test Bed, the enhancements to equip this facility to handle not just today's testing demonstrations, but they are also preparing us to take in new ideas in the innovations of tomorrow to give us the ability to integrate a full range of NextGen systems, and evaluate operational impacts.

And the dozens of systems that it houses today are really just a beginning truly. The Test Bed will constantly be modified, as they all are, as we complete the demonstrations and engineer additional platforms. We also look forward to the new technologies that the Test Bed will yield. This is a great facility, and it offers us the capacity for innovation and prototype testing, as well as demonstration.

And I think key to this is having access to the resources that Embry-Riddle provides to us that enhances the effectiveness in what we can do. And this combination will make it the birthplace of industry-driven concepts that will advance NextGen and the benefits that come from NextGen.

The FAA has awarded a $22 million contract towards NextGen research and development through an agreement with Embry-Riddle University. This agreement enables the FAA to leverage the experience and expertise that resides here at Embry-Riddle and many of the industry's partners also. We get to capitalize on all of that. It has already resulted in a number of solutions of the product and industry collaboration, and we expect to see even more developments ahead.

Although we are pleased to cut the ribbon here today and witness demonstrations of the cutting edge systems that exist, this event is more than just a celebration of what we have already accomplished. It is truly a call urging our industry partners to take advantage of the promise of the public and private partnership going forward that this facility represents.

We truly look forward to the evolution of our air transportation system. The chairman has cited a number of the benefits that we expect to receive as we move forward. NextGen is going to make travel more convenient, more dependable. It is going to improve safety and efficiency all at the same time. And a continuous roll

out of improvements and upgrades, all of these will come as we pioneer things here in the Test Bed.

This building has the ability to guide and track air traffic more precisely in order to save fuel and reduce costs. We will be able to test and implement those as we move forward. So, NextGen, as we know, is already a better way of doing business. It is a better way for the FAA, for the airlines, the airports, and the traveling public. It is better for safety, better for our environment, better for efficiency and flexibility, and overall it is better for the economy.

Congress has appropriated about $2.8 billion for NextGen in the last 5 years. The President has requested another billion dollars in the American Jobs Act for NextGen. We will continue to invest in the coming years, and those investments will bring us substantial returns. The chairman highlighted for us a number of those, and we expect to recoup our entire initial investment by 2018. We decided a 35 percent reduction compared to what would happen if we did not do anything. We find those to be very accurate projections.

All in all, we propose to save about 1.4 billion gallons of fuel; that will cut carbon dioxide emissions by 14 million tons. That is a lot of carbon emission reduction.

The NextGen benefits, however, do depend on getting stakeholders to invest in avionics, ground equipment, staffing, training, and procedures we will all have to use in order to take advantage of the infrastructure that the FAA establishes.

Their willingness to make these investments depends in return on the business case, their assessment of how valuable these benefits will be, and their confidence that the FAA can deliver in the timeframes and the manner required in order to realize those benefits.

Facilities like this one right here, this Florida NextGen Test Bed, helped make that case. Demonstrations and operational trials of specific NextGen systems and procedures actually let stakeholders see the very real benefits that NextGen can bring. They mitigate program risk. They show us whether we are on the right track in our technical approaches. They provide insight as to how equipment should be designed for the best operation, the best maintenance, and the human interface and automation comparisons. In this way, the Florida Test Bed will spur innovation. It will spur collaboration with the industry to speed the realization of the many benefits that NextGen has to offer.

NextGen is happening now, and I would note that if we delay the investment, our long-term costs to this Nation, to our passengers, and the entire environment overall will far exceed the costs of moving forward today.

Mr. Chairman, this concludes my prepared remarks, and I would be pleased to answer any questions at the appropriate time.

Mr. MICA. I think what we will do, if you do not mind, is we will go through everyone.

Mr. BABBITT. Sure.

Mr. MICA. And thank you for your patience. I am going to call on our next Government witness, which is Dr. Gerald Dillingham.

We have an important Federal partner in examining some of these programs and undertakings, and that is GAO. So, I thought it would be appropriate, first, if we heard from the Administrator,

and that we hear from Mr. Dillingham now, his candid open comments.

Welcome, sir. You are recognized.

Mr. DILLINGHAM. Thank you, Chairman Mica, Chairman Petri, Chairman Shuster, members of the committee. My statement today discusses the role of the NextGen Test Bed in the development of NextGen capabilities, together with some observations on how it can generally support a more robust R&D and technology transfer function throughout FAA.

As we have reported over the years to this committee, ATC modernization efforts often fail to meet cost, schedule, and performance targets for a number of reasons. In some cases, systems do not perform as intended because system operators and users were not involved early and continuously in technology planning and development. In other cases, commitment faltered also when projects lacked a home or a champion in FAA.

In addition, concerns about FAA's credibility, which arose when promised benefits did not materialize, or the agency stopped a program after the airlines had equipped, discouraged airlines from making further commitments needed to implement the technologies.

These issues plagued FAA's past ATC modernization effort, and despite substantial improvements, have surfaced again with the ERAM system. ERAM is now projected to be almost 4 years behind schedule and hundreds of millions of dollars over budget in part because FAA did not ensure adequate collaboration and cooperation among stakeholders.

The three test facilities that currently make up the NextGen Test Bed have the potential to address these past issues and make a significant contribution to accelerating the implementation of NextGen. The Test Bed is designed to bring together stakeholders early in the technology development process so participants can understand the benefits of operational improvements, identify potential risk, and foster partnerships between Government, industry, and academia.

Furthermore, the Test Bed provides access to the systems now in the NAS, which allows for testing and evaluating the integration and interoperability of new technologies. Such testing and evaluation are critical, since many of today's NAS systems will be in service for many years to come, and the new NextGen technologies and capabilities will have to be integrated with them.

The Test Bed can also serve as a forum for private companies to learn from each other and eventually enter into technology acquisition agreements or technology transfers with the FAA, with significantly reduced risk. However, our recent work on technology transfer has identified some lingering stakeholder concerns. For example, although work at the test site has allowed private sector participants to see how they might benefit from the technologies being tested, some of the participants told us it was not always clear what happened to the technologies that were successfully tested at the sites. They said in some cases it was not apparent whether the technologies being tested had a clear path to implementation, or a clear path to FAA's NAS infrastructure roadmap.

FAA's linking together of testing facilities, expanding the Florida facility, building a research and technology park adjacent to the new to the New Jersey facility to complement the capabilities of Embry-Riddle, are very positive steps that should also help to address some of these issues.

Our recent technology transfer work has also identified a gap in collaboration between FAA and the partner agencies that can inhibit technology transfer. For example, after several years of NextGen planning, FAA, DOD, and DHS have yet to fully identify what R&D technology or expertise at these agencies could support NextGen activities. According to NextGen stakeholders we spoke with, FAA could more effectively engage partner agencies' long-term planning by aligning implementation activities to partner agency mission priorities, and by obtaining buy-in for actions required to transfer on to NAS.

We have recommended that FAA and its partner agencies work together to clarify NextGen interagency priorities and enhanced technology transfers. Those recommendations are still pending. To its credit, FAA has implemented several of our recommendations for realigning its management structure and improving its oversight of NextGen acquisition, which in turn should help the agency to better manage the portfolios of capabilities across program offices. These changes have also placed a greater focus on accountability for NextGen implementation, and can help address issues like finding a home for FAA technologies. However, it is too early to tell whether these latest reorganizations will produce the desired results.

Mr. Chairman, in summary, we believe that FAA recognizes the importance and necessity of partnerships, and has taken several important steps to improve its ability to manage and enhance these technology transfer activities. We will continue to monitor developments and outcomes in this area and provide information and analysis to this committee.

Thank you, Mr. Chairman.

Mr. MICA. Thank you, and, again, we will withhold questions.

Now, what I will do is turn to two of the partners in this Test Bed activity. First, we will hear from academia, and representing Embry-Riddle, their president, Dr. Johnson. Welcome. You are recognized.

Mr. JOHNSON. Thank you, Mr. Chairman. I appreciate the opportunity to host the hearing today and to serve as a host for the Florida NextGen Test Bed facility.

Embry-Riddle Aeronautical University was founded in 1926, prior to the development of the aerospace industry. We worked closely with those industries to provide the needed personnel and manpower to make them successful. We have always had a corporate focus as we looked at partnering with aerospace companies. That has not changed as we develop next generation technology and make our air transportation system safer and more efficient.

The university is really quite unique. We offer 40 degree programs from the bachelors', masters', and through the Ph.D. level. The thing that I think makes the university great is that we have an outstanding college of aviation and an aerospace engineering program that is the largest and among the best schools of its type

in the world. We also have an engineering and space physics degree program that is one of the largest ABET accredited programs in the country. That synergy between aviation and engineering provides for wonderful opportunities for research. Problems are identified, tested, and real-world solutions are found.

We have been partnering with the aerospace industry, Mr. Chairman, for all of our existence. I agree with Dr. Dillingham's comments that we look very closely to not only Congress, but to the FAA to provide coordination of efforts across our aerospace industry partners, universities, and Government initiatives. Coordination is going to be very important to the future of the welfare of our aviation industry and our national air transportation system.

The University is uniquely prepared to do research. We have not only great colleges of aviation and engineering, but we also have a fleet of 100 small airplanes. We can redesign and test the avionics package on those airplanes. We can put biofuel in one engine of a twin and put regular avgas in the other and test them in a cost-effective manner. We can compare the efficacy of a biofuel versus a traditional petroleum-based fuel.

Mr. Chairman, we have been involved in developing NextGen technology in a very real sense for many years. In 2003, we equipped every one of our airplanes with satellite-based GPS-type technology, ADS–B. We have been flying those planes going on 8 years, and have had an opportunity to determine that the GPS satellite-based type of technology substantially enhances and increases not only accuracy in terms of identifying where planes are, but improves communication with the tower, allows us to see other airplanes in terms of altitude, closing speed, and to make efforts to separate aircraft to prevent accidents from happening. So, I think the development of satellite technology is something that is very important to safety.

Now, that is just one aspect of NextGen technology. We have also been working on improving ground safety by preventing runway incursions. We have been working with high-speed digital cameras along the runways and lighting systems that tell the approaching pilot that is on final whether or not there is an airplane on the runway. Active lighting systems will prevent incursions and accidents. All of those things are very important.

We are so pleased to be a partner with the FAA. It is doing a great job. We look forward to establishing additional relationships with our industry leaders, and feel we can help better serve our industry and the flying public. We feel that the Florida NextGen Test Bed is making great progress and offers great opportunities to strengthen our air transportation system.

In a very real sense, the Test Bed serves as a microcosm of our national air transportation system. We can test things efficiently and quickly, and make recommendations to the FAA and to Congress to improve the safety and efficiency of the system.

Thank you, Mr. Chairman.

Mr. MICA. Thank you, Dr. Johnson.

And we will turn now to Alan Caslavka. And Alan is the vice president, Avionics, for GE Aviation. And I think they have about total of 17 private sector partners in is this, and you are one of them.

Welcome, and you are recognized.

Mr. CASLAVKA. Thank you, Mr. Chairman. members of the committee, Alan Caslavka. As Chairman Mica indicated, I am vice president of aviation systems within the avionics group at General Electric. I thank you for the opportunity to testify today.

General Electric is making large investments to improve the global infrastructure not only in aviation, but in power generation, health delivery, and rail facilities as well. In the aviation world, most people think of GE as an engine provider, which we are, but we have broadened our horizons beyond the engine domain to focus on efficiency of broader aviation systems around the world.

We are fully engaged in trying to solve the toughest problems of aerospace and air traffic management. We see a tremendous opportunity to fundamentally transform our airspace and air traffic management infrastructure, to safely accommodate traffic growth more efficiently, more reliably, and in a way that positively impacts our environment and our communities.

In the U.S., we are focused on advancing NextGen. GE is currently involved with a number of next generation programs with the FAA, some of which are here at Embry-Riddle. We value tremendously the public/private partnership, and are hopeful that by collaborating with Government and academia, we will be able to accelerate the delivery of the benefit to aviation owners and operators.

GE Aviation Systems is the avionics member of the integrated airport initiative, the consortium that we are involved with here today at Embry-Riddle. The Test Bed program will host a number of demonstration programs that will allow us to develop and refine operational concepts, as well as validate the benefits and the technologies that it can provide. These programs help quantify what the benefits will be to key stakeholders, and often include life flights that lay the groundwork for transitioning into ongoing operations.

The programs that GE has been involved with at the Test Bed, though limited, have shown the value of collaborative R&D and the impact of an integrated demonstration center to showcase the combined NextGen capabilities of the FAA, Embry-Riddle, and the industry team. One FAA funded project, referred to as task G, is designed to leverage existing flight management systems, of which we have a domain expertise, and the technology to validate trajectory-based operations, which we believe is key going forward in this particular domain.

Implementation will help aircraft fly more optimized routes, conduct idle descents, and also to have more efficient shorter paths to the terminal.

We look forward to funding under another project, task E, where we will demonstrate the flight of a Predator UAS unmanned air system, with a modified 737 flight management system that will digitally link to air traffic control. These proof of concept flights will show the ability of the FMS equipped UAS to fly very precise paths, even in a situation where you have lots of flying contingencies, while giving air traffic controllers a high degree of confidence in the UAS intended path.

Demonstrations under task E and another FAA program, network enabled operation, otherwise known as NEO, later this month will help pave the way for expanded UAS access to national airspace.

The increasing involvement of the FAA in Test Bed activities is valuable, not only to fund demonstrations, but to enable moving the technologies closer to the demonstration from a demonstration into an operational use in national airspace. We recommend that Test Bed projects be expanded beyond just demonstrations to include a forum for funded collaborative R&D programs for near and midterm next generation capabilities.

I would like to take a moment to talk about the value of collaboration between the FAA and private sector in the deployment of near-term NextGen economic and environmental benefits. GE has developed a great deal of experience deploying performance-based navigation—specifically, RNP paths is what it is referred to. In collaboration with the Government, regulatory agencies, and airlines, we have designed and deployed more than 340 RNP procedures in over seven countries. Based on that experience, we find clear and compelling evidence that PBN, if implemented properly, can immediately reduce aircraft track miles, fuel consumption, and CO2 emissions. The kinds of near-term benefits PBN brings unalign with the recent recommendation of the NextGen Advisory Committee to develop and deploy RNP instrument procedures that would allow currently equipped users to routinely fly them and achieve associated benefits. We estimate that over 50 percent of the aircraft flying in airspace today have that capability.

The quickest and most efficient way to deploy these procedures, we believe, is to engage qualified commercial PBN service providers, like ourselves here at GE, and work closely with the FAA to design and deploy them. The FAA policy for this collaboration already exists within the current regulatory framework, and work could begin immediately. Collaborative research and development and public/private partnerships are critical to deliver tangible benefits of NextGen to the operators who utilize our airspace. NextGen demonstrations need to be about getting on with the benefits of the technologies and the operations into the hands of airspace users faster and more smoothly.

GE Aviation is proud to be a part of the integrated airport initiative and the Florida Test Bed. We look forward to working with the FAA, Embry-Riddle, and our industry partners to demonstrate real NextGen benefits for the operational users of NAS in the weeks and months to come.

Thank you.

Mr. MICA. Thank you for your testimony. I will turn now to the president and chief executive officer of the Aerospace Industries Association, Marion Blakey.

Ms. BLAKEY. Thank you, Chairman Mica. Chairman Petri, Chairman Shuster, and Congressman Farenthold, and Alex, thank you very much for having this today because this is an important event, an important hearing as you unveil the Florida NextGen Test Bed.

As you know, I was here about 16 months ago, so this is really remarkable to see the progress that has been made since then. And

I have to commend Dr. Johnson and his team for what he has accomplished. You've got a lot to be proud of in a very short period of time.

I am here representing the Aerospace Industries Association, AIA, which is the premiere trade association of manufacturers and producers of aerospace and defense industry products. Over 340 members manufacture the aircraft that fly in our airspace, the systems that guide them, and the satellites and unmanned aircraft that are a part of the wave of the future. Our members are vitally interested in seeing NextGen succeed, and many of them are partners here with the NextGen Test Bed.

Mr. Chairman, I do not think there is any question about the cost benefit of NextGen. Tom Captain, who you have recently had at a hearing, has done a study for Deloitte Touche. I think he captured it perfectly in one of the hearings where he said, "NextGen has an open and shut business case."

What we hear from industry, though, is a call for stronger coordination. I think you have heard some of that this morning from the private sector, including aircraft manufacturers, airlines, and the manufacturers of equipment. As we speak, new ADSB ground stations are being commissioned, more aircraft are equipping and flying. But we are not realizing the full value of these benefits. The development and approval of procedures is simply lagging the technology. Mr. Caslavka just referred to this, and I have to say, Mr. Administrator, we are very encouraged that the FAA has certainly bought into public/private partnerships. And the example here in Florida could be applied vigorously all over the country, we believe, to advance NextGen.

To its credit, as I say, FAA is responding. The agency recently reorganized the NextGen management team, raised its organizational priority, and we are very delighted that the NextGen executive now reports directly to deputy administrator Huerta.

We know that NextGen is a priority of the agency, but we also fear that the coming budget reductions are going to make it hard for NextGen to stay on track.

FAA's long-range budget was already programmed at flat levels to the year 2016. Then the Budget Control Act, passed in July, required funding cuts below these levels. And if that were not enough, we now see that further reductions, part of the sequester, may occur when the Joint Select Committee on Deficit Reduction issues its recommendations later this month. This is a perilous situation.

And as, Mr. Chairman, you know better than anyone else, FAA is primarily an operating agency. Two-thirds of its funding goes to operating costs. Seventy percent of that is needed to make payroll. We all know what happens when operating budgets are pitted against transformational capabilities. Operating budgets win.

We also know that the agency's facilities and equipment budget, where most of NextGen is funded, was already projected to decline slightly over the next 5 years. I fear that if these additional cuts are disproportionately applied to NextGen, we may never recover the momentum we have today, or regain the support of a skeptical industry. We will lose our technological stature in global air traffic management to other, fast-moving nations in Europe and Asia. And

when our economy and air travel begin to pick up—as we know they will—we will not be ready with the new technologies that are needed. In short, Mr. Chairman, as budgets get tighter, FAA's role in explaining and demonstrating NextGen's benefits will become more critical. Likewise, AIA is doing its part in that education campaign, to make sure that our aviation system remains second to none.

Mr. Chairman, the National Airspace System is a ballet of sorts that plays out each day in our skies and at our airports. It involves the planning, coordination and actions of flight crews, dispatchers, airports, and air traffic controllers, to name just a few. FAA's services are providing businesslike benefits to the U.S. economy, something relatively rare in the Federal Government. Inefficiencies in the management of our air traffic control system, or lack of capital investment, have a direct impact on industry, and stifle our ability to compete. And that's where the NextGen Test Bed comes in.

FAA and industry need an environment where NextGen concepts are tested without affecting the day-to-day operations of the air traffic control system. The agency needs to model, simulate, and verify new technologies under different scenarios. These results will help the FAA make data-driven decisions that speed up NextGen's implementation, and bring benefits sooner.

Mr. Chairman, there is no better institution to assist FAA in the Test Bed than Embry-Riddle, the world's largest and most prestigious aviation and aerospace university. They have advised the FAA for over 30 years, and I counted on their advice when I served as FAA Administrator. Professors, retired controllers, and pilots, as well as Embry-Riddle's fleet of over 90 aircraft will all have access to the new NextGen Test Bed.

With the help of a growing number of industry partners, Embry-Riddle has doubled the size of the Test Bed and vastly increased its software and tracking capabilities. The Test Bed now works with at least 15 companies. In fact, industry has invested at least $1 million of its own in the Test Bed. This is a clear sign of industry confidence. And it is a great example of public-private partnership—companies, academia, and the Government working, and jointly funding, a program to address important challenges.

In conclusion, Mr. Chairman, we have recently been celebrating the life of Apple co-founder Steve Jobs. With his inventive genius, Jobs helped untether the world from the wires of mainframes, landline telephones, and CD changers. And that's exactly what NextGen promises to do for aviation. It promises to untether air traffic control from ground radars, phone lines, and voice switches. It promises to untether aircraft from the fixed airways they fly through today, allowing them to fly routes that are most efficient for their users.

Just as Steve Jobs saw that the world of consumer electronics was ready to move beyond boundaries set in the 1960s, so too is the world of aviation. In fact, the aerospace industry is chafing at those bonds today. So it's exciting to be here as Embry-Riddle, its industry partners, and FAA help make the vision of NextGen a reality.

Mr. MICA. Thank you for your testimony. Mr. Bunce.

Mr. BUNCE.——several Embry-Riddle graduates, and I rely on them each day and very senior leadership positions to be able to help guide the general aviation portion of this industry, and the product that you produce here is first hand top notch.

And it also is pretty neat for me to be able to walk around this campus. Every time I come down here, I am really struck by the nature of the international flavor that you get down here. And our industry is global. Right now, we are hurting badly because of the economy in the U.S. and Europe, and over 70 percent of the revenue that we will bring in this year is from sales of aircraft going over to the Far East down to Latin America and the Brazil area, and areas of the Middle East. So, the global nature of this industry really relies on the education that——

——is out at airports. We are partnering with academia to be able to leverage the ADSB technology that is going to be mandated in most aircraft by 2020. And the traffic situational awareness alerting system basically allows general aviation aircraft to have an alert warning system like the airlines have with their system call TCAS, but TCAS is just too expensive to put in most of the general aviation aircraft, other than just the high-end business type of aircraft. So, this is extremely important, and MIT is partnering with the FAA on that issue.

We are celebrating the 10th anniversary of a program that we called the Center for General Aviation Research. CGAR is the acronym we give to it. But it is part of the Center of Excellence program that the FAA has set up with academia, of which Embry-Riddle is one of the premiere players in this.

What we get out of that is absolutely phenomenal. When you look at the fleet of aircraft that is out here on the ramp at Embry-Riddle, just being able to use ADSB to tracking the fleet, getting the data in that helps us understand we are in high-density aircraft and traffic environments so we can go and be able to use ADSB to be able to precisely manage aircraft is important.

Dr. Johnson mentioned what we are doing on the research for the unleaded avgas that we have to convert to. We know we have got to get away from leaded fuel, and they are helping us tremendously there.

Accident trend analysis becomes very important, and probably the premier thing that we are getting out of the CR initiative is experience in looking at glass cockpit technology and looking at training standards and testing standards to be able to allow people to use glass cockpits. And we all know that that technology is now going into a lot of airline aircraft, but if you go into a modern business jet or a turbo prop today, or the high-end pistons, you are going to find actually a more advanced glass cockpit that you find in most of the airlines right now. And so, the research that we are doing here is very important.

Now, could we do some things better? I think we can. We do not have a lot of money in industry right now, and we are not able to give academia a lot of research dollars to help us with some of the issues and some of the projects that we want help with. But we certainly would appreciate a call from all of our institutions saying, hey, we got students that are going to have to write papers; are there topics that you want us to research for you? And we can le-

verage them, and actually it helps the students because you get a paper, and one of my employees is a prime example of this. He wrote an outstanding paper, and Cessna hired him the day he graduated just off the paper that he wrote here. And we can leverage off of that.

Also, the FAA is very software dependent right now, or we as an industry are software dependent, and the FAA's very limited resources to be able to go and help us certify product that is almost wholly software dependent. We are in a situation right now because of resources available at the FAA that were in sequencing issues where we have got to streamline processes to be able to get our product to market. But in addition to that, we need to be able to use the expertise that we have in academia with software expertise to be able to help the FAA help industry to be able to produce the products for NextGen.

So, we are absolutely committed as the General Aviation Manufacturers to this public/private partnership, both between the FAA and industry, industry and academia, and academia and the FAA, because that is the only way we will make NextGen work.

Thank you, Mr. Chairman.

Mr. MICA. Well, thank you. And I want to thank all of our witnesses for their testimony. And the next order of business will be questions from Members of Congress to our panelists.

I brought this headline with me. It says, "modernization of air traffic may be delayed." It was a couple of months ago in the Washington Post. And we just heard the GAO cite that, let us see, that we do not need the most costs or schedules set forth, and gave an example of ERAM some 4 years behind schedule.

Some of these programs are important components, parts of any next generation air traffic control technology. Mr. Administrator, maybe you could respond.

The other thing, too, Ms. Blakey raised the issue of financing. I have checked in periodically, and told that the finances are adequate, but I heard that we are not keeping up in other aspects of moving forward. Would you like to comment?

Mr. BABBITT. Certainly. I guess one of the issues with these projects, and you noted ERAM; that is a good example. ERAM is probably one of the largest software that is currently going on in the country [inaudible] doing other things.

The program has been going 9 years. When I became the administrator, one of the things we clearly had run into some technical difficulties. I literally stopped the program, and I asked everyone to just step back, and let us completely reevaluate where we are. What is the issues? Are we having proper program management oversight? This is technology; are we really being asked to deploy oversight and management program. It was being vetted before our eyes.

Yes, we did it. I am very comfortable now, however, that we have reestablished a new waterfall schedule in communication. We are on that track. We are currently, to the best of my knowledge, on budget. It is a huge project, which you can imagine. We are changing an entire analog system that has been in existence for nearly 40 years in a complete digital integrated environment. But I am

comfortable in saying going forward I am very comfortable with the targets, and we should be able to stay on the revised scheduling.

Mr. MICA. Dr. Dillingham, one of the things that concerns me—we do have three Test Beds. I have read your analysis of their mission. Do you view any of it as duplicative, or do you think they all serve, again, a beneficial purpose in this long-term development?

Mr. DILLINGHAM. Thank you, Mr. Chairman. As we analyzed the three Test Beds, we did not see anything duplicative. But what we understand is that research has to be validated. And we saw some of that, but we would not call it duplicative. But it is the kind of repetition that you need to do when you are doing research to reduce risk.

So, the short answer is, no, we did not find any duplication that we would say is unnecessary.

Mr. MICA. Well, one of the things that was raised, issues that was raised, is we have developed some technology and maybe some systems or some protocols, but there seems to be a delay or a failure to utilize, take these improvements to the next level. Any suggestions? Maybe two of the participants, Mr. Caslavka? Any ideas on how we could improve that? You are involved in an important component. Do you see that as a problem, and how can we solve it?

Mr. CASLAVKA. Yeah. I mean, from my perspective, I want to see us continue to advance in that area. You know, specifically, I see it as a benefit for business and for academia, an improvement for business and academia in that area.

As you know, when we look at what we hope to gain from our adventure here with Embry-Riddle and the organizations that we have here, we have performance-based navigation and front management systems that aid in the development of a Test Bed and the initiatives here with the tasks we are involved with. And improving flight in the national airspace is fundamentally important as over the next 20 years we see issues with flight traffic almost doubling in that timeframe.

Mr. MICA. Well, you know, you are from the private sector. You are not doing this just to keep all these occupied Wall Street people happy. You want to sell a product, either hardware or software, or systems, and it appears that while we may be developing some, say, the next generation of equipment software technology, that it is not going anywhere. How do we take it to the next level?

Mr. CASLAVKA. So, I do not necessarily view it as not going anywhere. If you look at airspace travel today, a lot of the systems that are in use today in air traffic do have adequate flight management systems and adequate performance-based standards of opportunities. So, it is just a matter of continuing to evolve that and grow it beyond where it is today.

We are currently working initiatives that are heavily involved in performance-based flight management systems. And if you look at some of the studies that we have recently done, I mentioned earlier that we have over 340 PBN-based solutions today. But if you take a look at a recent study we put together for the FAA, we clearly see the benefits of emissions, fuel savings, noise pollution, and safety associated with the study that we did.

And we looked at 46 airports here in the United States, and what the benefits would be associated with implementing performance-based navigation departures and arrivals. In those 46 airports, over 13 million gallons of fuel could be saved over a 1-year period, 274 million pounds of CO2 emissions, as well as $65 million of operating costs in 2 years of flight time.

So, the initiatives are getting off the ground, and what we are doing here with the tests that we have with Embry-Riddle are contributing. So, I do not view it as not going anywhere, but it needs to continue to move along.

Mr. MICA. Well, one of the customers for the equipment, the big customer is FAA. Mr. Babbitt, one of the things that we have got in our proposed legislation—let us see. It streamlines the FAA certification for NextGen technologies and flight paths. Is that adequate to give you the direction? Again, things are produced. We want them installed. They do have to have some buy in to the customer, which is FAA and to the airlines, to the industry.

And, again, one of the criticisms is we have deadlines. Someone said FAA not moving. We have some deadlines. We have some streamlining that is proposed in the bill. Speak now or forever hold your peace because this may become law very soon.

Mr. BABBITT. Well, there are three important components when you build a system like this. Obviously we have to have ground-based construction to do deployments on schedule. We should be up and running actually ahead of schedule, and we want all of the ground-based GPS and AVS stations.

Secondly, we have got to have the appropriate airplanes that you use. One of the things I talked about in the testimony is being able to prove that these things work, and having private partners like GE, who actually goes out and forecasts for us, they can [inaudible].

The third piece is we simply have to have the procedures in place. We have undertaken of our own initiative a streamlining of the process where we have developed a procedure, not an old one, but a new procedure. And we have eliminated about 50 percent of the time to develop that. We simply went through using the lean and the Six Sigma reviews. Where were we wasting time? What was taking this process so long? Do you mind if we streamline that? So, I am comfortable that we are on the right track.

Now, all these three parts just simply have to play together. It does not do us any good to have all the equipment and all of the both airplane and ground and not have procedures.

Additionally, we have got to train the pilots and the air traffic controllers. We also get to a point of having a critical mass who are affected, for example, if we have 50 airplanes an hour arriving at LaGuardia, and only three of them were equipped and ready to shoot the arrival approach, approach, that does not fix LaGuardia. If 45 of them do, you know, best equipped will have to best. So, I think we appreciate the support, and I think we are on track.

Mr. MICA. What about the deadline and the blueprint that is set out here? Do you think that is adequate?

Mr. BABBITT. I do. I do.

Mr. MICA. Well, let me go to the industry folks, Ms. Blakey and Mr. Bunce. What do you think? Again, you have seen what has

been crafted and drafted. Is this adequate to keep this on schedule? Ms. Blakey?

Ms. BLAKEY. I think it is. More specificity about the schedule and the metrics that need to be met is going to be very important. In other words, fleshing this out, because that cannot all be done through legislation. We think industry working with the FAA on the specifics here will work well.

We are also keen to see further integration of these Test Beds, and the research that is being done, for example, at NASA and Mitre, and others, very important work, all integrated together closely, and really tracked right into a demonstration and into operations.

Mr. BUNCE. Mr. Chairman, I would add just two things, and I will drill down a little bit on what Marion said there.

The first one is on the metrics. I know that we have a great partner in the administrator, and he is working very closely with us. But he has got to steer a ship that is very difficult to steer. And the first thing that you have to do is you have to adopt metrics that we can measure success of NextGen. And your committee put forward metrics in your bill, and I understand that the Senate somewhat agreed to it, and it is frustrating for us in industry not to see an adoption right away even before the bill is passed, of metrics that we can go ahead and measure progress against. So, I think that is step one.

The second one is exactly what Marion just mentioned. The United States military went and they networked all their simulators between their fighters, tankers, bombers, so that they could save money, and they could fly missions like they do out at Nellis Air Force Base, red flags, just with folks sitting on terra firma in simulators, everything all linked together. We can do that as well. And that critical mass that Randy was talking about that we have to get is extremely expensive when you're driving people around in the air burning gas, and we have to wait until some mandatory equippage dates to be able to drive some of that critical mass.

But we can do it by networking simulators and centers of excellence together to be able to go and test some of these concepts. Data link is one of the primary ways that we can go and take a look at what it looks like, get all of these centers, controllers at one, students at the other, because if you think about whose flying our airplanes, and that it is young people. And if they get down in the systems for data link and prove it against grizzled old controllers, the system will work.

Mr. MICA. Finally, well, two things. One, have you got enough money, and from what you have seen, our authorization does, I think we are going to end up with a higher rather than a lower figure. Is that adequate from what you have seen?

Mr. BABBITT. We submitted this [inaudible], but it probably would not be, you know, totally accurate. We understand, like everybody, is that this was [inaudible] today. I think the funding enables us to do a lot of things. I think one of the important parts about our budget request is this is one of the few agencies, as you pointed out, that we are an operating agency, but a lot of what we put in place here would be operational equipment facilities, and just like if we were a board of directors. And we looked at whether

we should buy new equipment, we would ask what equipment, we would tell you it is very positive.

The faster we can buy the equipment, the faster we can put it into place, the more quickly we would use it. You are going to be able to benefit from it, save that fuel, reduce that noise, increase throughput with airports. Airports are assets. People pay a lot of money to build an airport in a town, and they want to serve that town. And if we can increase the throughput formula, the investment in equipment would help. Then we would get our money back.

This is one of those cases where we appreciate what we get paid on the—but I would suggest the kind of money belt that we are looking for, we might be able to deploy that equipment more quickly.

Mr. MICA. Well, the final thing, and if anyone wants to comment, this is a global race, too, because whoever accepts the protocols and develops the technology, the software, the systems, also wins the world market. And that is a prize that generations will benefit from, and it will be in place. Anyone want to comment on how we are doing compared to the Europeans and even, I guess, the Chinese in their own little march?

Mr. JOHNSON. Mr. Chairman, we are a global institution. We have 150 campuses around the world—14 in Europe, 3 in the Middle East, and we just opened 1 in Singapore. So, we have a good deal of opportunity to interact with the aerospace leaders in those regions. Our faculty and our administrators interact fairly routinely with both the private companies and governments around the world as we establish campuses and relationships.

Our clear perception is that we are in the lead. Europeans are working very hard on NextGen technology. However, the United States has an edge in not only the genius of our private industry and our universities, but also because we have established some integrated efforts to bring together universities, private partners, and Government toward a common purpose.

I believe we are on track to develop the kind of technology and deploy a system that will improve our national air transportation system more quickly.

Embry-Riddle is working on establishing an aerospace research and technology park. Our motivation is to try and contribute to the safety and efficiency of our national air transportation system.

In addition to NextGen, we are working on unmanned autonomous systems and whether or not unmanned aerial vehicles can be made safe and reliable in commercial airspace. We are conducting research with other universities as well as selected aerospace industry partners to address these concerns.

So, the short answer, Mr. Chairman, is that I think we are ahead.

Mr. MICA. Dr. Dillingham.

Mr. DILLINGHAM. Chairman Mica, we just recently completed a study for your committee with regard to how the U.S. is faring with the Europeans and their effort of SESAR, which is the same as our NextGen. And they are having similar problems as the U.S. in terms of bringing it all together because of the many countries that they have to bring together.

But besides that, I think the FAA is probably doing a tremendous job with regard to working with the European Union. They just signed an MOU that described how they would work together and what they were aiming for. We also know that FAA is a significant player in the International Civil Aviation Organization, and they are also moving in that direction.

I think one of the differences between the U.S. and the Europeans is that the Europeans started off with a public/private kind of orientation. I think we have caught up with them, and the linking together of the Test Bed, and academia, and FAA, and the rest of the Government is the way that is going to keep us ahead of the game.

Mr. MICA. Thank you.

Mr. CASLAVKA. Mr. Chairman, I would like to comment on that as well.

Mr. MICA. Yes.

Mr. CASLAVKA. So, I concur with what Mr. Johnson is saying relative to how we are progressing against SESAR. I do believe that we are ahead today, but I am concerned as an industry partner that we need to continue to look at policies very firmly. We need to continue to invest in the technologies like the demonstrations that we are doing here with trajectory-based operations and performance-based navigation. So, it is extremely important that we keep those things on track, we keep them funded, and we keep industry involved heavily with the FAA jointly progressing these initiatives.

Mr. BUNCE. Mr. Chairman, I would just add that when I look at SESAR and NextGen together, they truly can be complemented. If you look and you go into some of the specifics that Mr. Dillingham was talking about, if you look at ADS–B, we are far ahead. They do not have any ground infrastructure deployed, and they really do not have a good plan, so ADS–B does not work unless you have a ground infrastructure. So, we are obviously going to be ahead there.

But they are mandating equippage for data com much earlier. We do not have any mandatory equippage except for data com. They do, so industry is going to adapt to what the Europeans require, and we need to leverage off of what they are going to learn in data com for our systems so we can leverage what is valuable in both.

And then, you take what the Chinese are doing, and I really want to compliment the FAA administrator here because a lot of the rulemaking that is going forward now for aviation is something that we have to do in tandem with our partners. So, the FAA administrator has been very willing to allow us to invite observers from EASA to be part of rulemaking, and now also the CAAC, the regulatory body within China, because if we get a one set of regulations for our equippage out there, then industry can universally go and equip, and we do not have to have different aircraft flying or different aircraft equipped to fly in different environments. We have to have that, and really Administrator Babbitt has been a partner with this.

Mr. MICA. Again, we hope this sets the parameters, at least for the next 4 years, of legislation. I was asking staff if we have a data

com provision in there. We will check that, and if there is something we can do to ensure that we are, again, moving forward—anything, Mr. Babbitt?

Mr. BABBITT. Yes, sir. I would only add, and I appreciate the observations made. I think there is a fundamentally a pretty significant difference between the way the Europeans are approaching this. They have as, Mr. Bunce noted, they do not have an infrastructure. It is all theoretical. We, on the other hand, field test, prove using the Test Beds, we take concepts, we develop them, we test them, we demonstrate them, we put into the systems. We have 250,000 square miles in the Gulf of Mexico. We are moving traffic today in positively controlled environments using ADS–B in partnership with the industry, helicopters, petroleum.

So, we are testing these things. We have a half a dozen airports around the country where we would actually use a profile on these things where we save 60 gallons of fuel every day, and we will continue to expand it.

So, ours is a build, implement, and expand type of process, work with the industry. We have a variety of sources of input, and that is why I think this Test Bed will help us remain in front and make a lot of progress.

Mr. MICA. Well, we trust you. We are just going to verify.

[Laughter.]

Mr. MICA. Let me yield for the purpose of questions. Chairman Petri.

Mr. PETRI. Thank you, Mr. Chairman. Just one quick comment, and that is that Administrator Babbitt just spoke briefly about the enormous pay off. We recently had a hearing where a representative of one of the leading international accounting firms said he had looked at and analyzed this. And it is a slam dunk from an investor's point of view. If things were done on schedule by 2018, they predicted an over 40 percent return, and if it could be done, as you indicated, possibly 3 years earlier, it would be over 60 percent return on the Federal investment. And that is astonishing.

And, of course, it is not just a light switch you turn on and off. You are putting in place a whole new procedure that will tend to gain momentum and spread through a major sector of the world's economy. So, it is very important.

One question. When I talk about this whole thing to rotary clubs or service groups back in my district, they were very excited because we are a little glum about Government, you know. And right now, things seem to be negative. But this is an area of great, positive, you know, it is a bright, shining light of progress in a lot of areas.

One question I get constantly is, what about security in terms of what if someone were to wish us harm, whether another country or some other group? Is there a way they can shoot down a satellite or foul the thing up? And if we put all of our eggs in this basket and move off radar, will we be vulnerable? Could you discuss that?

Mr. BABBITT. Sure. That is a concern, and we should have that concern for any navigation system that we have. We have backup alternatives. One of the areas that we are researching is what would be our primary fallback? For some reason, it is hard to imagine that we could lose an entire array of satellites possible. So, it

still would be a very long time before we get rid of primary radar. The military is not going to be without it.

We have other tools on board the aircraft today. Most of the modern aircraft are equipped with modern capabilities, which means they listen to any number of things. Most modern airplanes built in the last 10 years have inertia navigation where the airplane just knows where it is by its own virtue. It knew where it started, it maintains awareness of its movement, and, therefore, it—all of those are capable of being translated, and all of those are a check against their own GPS.

So, we have some alternatives out there, and we will deploy them. But you are right, some of this is grounds for mischief, and we want to protect against that just like we concern ourselves with cyber security. We will use our structure for communication and data to cover some of these things.

But I am comfortable that we have enough backup in place if, you know, we have a threat to the entire system.

Ms. BLAKEY. Mr. Chairman, if I might add one point, because we have the opportunity as industry of observing the Joint Planning and Development Office's work among the agencies. There is a good partnership there, and that jointness is important.

We would love to see more energetic engagement from the Department of Homeland Security. I think that is an area where, frankly, we do need the committee's help in terms of urging the DHS to become a more active partner when it comes to the security front. And I would support that.

Mr. MICA. Mr. Shuster.

Mr. SHUSTER. Thank you, Mr. Chairman. Mr. Babbitt, how confident are you that in 2018 we are going to have a roll out?

Mr. BABBITT. Oh, I am highly confident. Highly confident. We will have our ground infrastructure fully operable 4 years before that. And I think, again, in the business case, how well the system is embraced is highly dependent on the insurance that people get. We did see one of our early adopters come into place, and we are looking right now as to what happened early on. They had a high percentage of use, and now Congress says they are not using it as much. Well, why? The controller is not educated or the pilot is not asking for the approaches and so forth.

We want to get to the bottom of that because we want people to use it. The more people that use it, the more savings that are going to be there to sell [inaudible] equipment use.

Mr. SHUSTER. Mr. Petri point out. I have read some of the same analysis that he has read that here is the business case, strongly one of them. And I guess the ultimate end user is the airlines. Are they talking to your folks at Boeing and Mr.—is it Bunce? The General Avionics folks. Are they trying to pull it forward with the end users that want to buy these things? What are they saying when you ask the question?

Ms. BLAKEY. I think from the standpoint of the airlines, of course, the airlines are the ultimate customer for a great deal of our aircraft parts and operational aircraft deployed. They want to get the most out of the equipment that is already on the aircraft. I think that is fair to say that this is a lot of capability that is flying up there now. They also feel it is critical to get the system in

place because that is the only way that they are going to be able to deal with the traffic that is coming.

I think from the standpoint of our manufacturers, our greatest threat is the issue that the system will not be ready for the traffic that is coming, and congestion, and the dampening, therefore, of demand and dampening of our economy. It is a huge problem. We are genuinely worried about it.

Mr. SHUSTER. Which part of the system? You pointed out the three parts, procedures, the infrastructure, or the equipment? All three of them will not be in place, or they are concerned about not being in place, or one of the three they are concerned about?

Ms. BLAKEY. I think the first two really have to come into play because it is not reasonable to ask businesses like the airlines, which frankly struggle to make the kind of corporate investment that is needed for equipment, unless they are pretty sure. The infrastructure has got to be there and the support. It is like asking people to buy cars, but there are no highways. That does not work.

Mr. BABBITT. We use the analogy that I use is the high-definition cable box. And say, well, how many network challenges I am showing. So, if it is 2 now, then we are going to get 50.

[Laughter.]

Mr. BABBITT. When you get to 50, call me and I will buy a lot of them.

[Laughter.]

Mr. BABBITT. And that is sort of where we are. We need to produce those procedures, and that is a hurdle that we need to achieve.

Mr. CASLAVKA. Chairman Shuster, I think that it is really a conundrum that the administrator pointed out because it has chicken and egg. It is chicken and egg, because the ground infrastructure will be in place, and in 2013 we will have the ground infrastructure out there. We need to have critical mass for equippage, and we need to have those procedures out there.

Procedures right now that simply overlay today's approach, they can give us some benefit, but the true benefit is when we can develop new approaches, redesign airspace, and, of course, we have environmental concerns there. If we could streamline that NEPA process, that is really one thing that can help us a lot.

But on the equippage, what concerns us is we have to see those types of benefits, and the conundrum that the administrator is in is, as he pointed out, if only a few equip, then you actually get less efficient if you give them best equip/best serve, because then you have got to put everybody into a different pipe if you segregated runways.

So, if we can figure out a way, this idea of an infrastructure development bank, or some of the creative ways that we have some of our different companies say, OK, we will loan to the money to people to equip, and as soon as they can accrue some of the benefits, then they have to be able to pay it back. When we have a surefire way to measure these benefits, OK, then they will start paying back. That is a way that we could potentially achieve the critical mass that we need to make this really work rapidly.

Mr. SHUSTER. You mentioned earlier about metrics. We put into the legislation—I think I heard Mr. Bunce answer the question. I

do not know if he fully completed it. Is there any prohibition on you accepting what is in there now and saying this is what we are going to use? Is there any reason you cannot move forward without legislation being passed?

Mr. BABBITT. Well, I would like to think it is in our best interest and the industry's best interest to deploy everything we can as quickly as we can and benefit from it. They made the investment; we made the investment. I mean, metrics are good targets.

One of the things that we struggle with a little bit is this is a very rapidly developing and new integrated technology. So, the metrics, you know, we have to be careful that we do not get about halfway through it and somebody says, hey, we have a whole new, better data system just invented yesterday; we should use that instead.

Metrics change. Our process changes at some point. And we have to accept them the way they are, but we are never [inaudible]. Things will come out of this Test Bed we have not even thought about yet. I am certain that in 2 years it will be something here that we should deploy.

Mr. SHUSTER. Dr. Dillingham.

Mr. DILLINGHAM. Chairman Shuster, I wanted to add that this is an opportune time to go forward in that we recently had the RTCA report that made a lot of suggestions for near-term, mid-term implementation of NextGen. And FAA has taken those recommendations into its plan and is beginning to move towards implementing them.

This is one of the first times that we have had airlines, avionics manufacturers, FAA, everybody at the table saying if you do this, if you bring these benefits in this timeframe, we are on board.

And so, this is an opportune time to make it go forward.

Mr. SHUSTER. But you also said in your report that you did not think that the private industry stakeholders were brought into it at all.

Mr. DILLINGHAM. Yes. That is one of the things that has to happen, that those who are participants need to be a part of it. Otherwise, you run the risk of when that system is fielded or the beginnings of fielding, that the people who operate it will say, this does not work for me. And it could be something as simple as, this button feels like this button, and I am watching the screen, and I cannot do it. Or it could be something a lot more sophisticated in terms of software development. But, yes, you definitely need to bring those on board.

And that has been legislated as well. So, hopefully lots of things are in place to make it work.

Mr. SHUSTER. Are you saying now that they are not fully involved in it and they need to be?

Mr. DILLINGHAM. They were not fully involved early on. Now, there is legislation and there is the will to involve everyone. So, the promise there.

Mr. CASLAVKA. So, let me talk from an industry perspective as well. Clearly we have made a lot of investments associated with NextGen, even before it was NextGen, in our FMS solution, and also in our procedures for performance-based and arrivals and departures.

So, I had a meeting with my team here just within the last 2 weeks where we are looking closely at what are we going to do in support of NextGen from an investment standpoint. And we laid out a strategy in those areas. So, we are focusing on that.

This does not have to be a homerun. It can be incremental steps. And, yes, we run into issues, like Mr. Bunce indicated, relative to implementing new procedures to get the efficiencies associated with landing and departures. But we can take those steps, and we are trying to work with Mr. Babbitt and his team to make those steps possible. Start with selective airports and continue to progress to realize some of the advantages so you can do more of an incremental approach rather than just go for the homerun.

Mr. SHUSTER. Do you feel that you are involved at a level you need to be at this point?

Mr. BUNCE. I think that the FAA brings us on board. Again, go back to the metrics. I think that it is important to measure where we are today because if you think about it, every time any one of us jumps on an airplane today, they are in an open seat. So, we contracted about as much as we can contract. The only way we are going to go is more aircraft out there, both on the commercial side and on the general aviation as soon as this economy starts to really recover.

So, for us to be able to measure, OK, what happens, what is the baseline today, and real metrics that we can go and then measure against as that traffic builds, and we implement the NextGen technologies I think becomes very important.

Mr. SHUSTER. Mr. Chairman, I have one more question.

Mr. MICA. Go right ahead.

Mr. SHUSTER. And this comes up over and over and over again throughout the Government, different agencies who all work together, like you said, DHS and DOD. I just thought maybe you could address it. What do you think is DHS' problem? Why are they not engaging in this area? Is it just the cultural differences in DOD, or they do not have time for it, or they are just not engaged at this time? I cannot get through to these agencies that it is so important when we talk about something—security. It is about safety. So, they need to be engaged.

Ms. BLAKEY. You know, I can speak to that problem from my historical perspective on this, and then I would yield to Administrator Babbitt on this and Dr. Dillingham. But what I do think has been part of the problem is that DHS has not grasped the vision that NextGen brings to the transformation of an aviation system.

One of the biggest obstacles all of us see for aviation to realize its potential in this economy and this country is security. It is the hassle factor. It is the time, which is, I think, by almost everyone's standards, unreasonable today.

That vision of building security into the system, building in network information so that you really do begin to have total gate pushback to destination security built all the way through in the information management system is something that could be done. But we do not see DHS, in my historical experience, stepping up, probably because they were forming at the time. They had a lot on their plate. I think it was in the early stages of NextGen.

But, as I say, I would yield to Administrator Babbitt on the current situation.

Mr. BABBITT. I think some of the issues that might be there are the perception of emission versus hours, and private would be included in that. And I think we are making some progress, trying to improve them. We have got the displays. We think it would be critical information to know a lot about a particular flight. Sometimes they, for security reasons they want to know a number of things—how much fuel is on this airplane, where is it on the airport. We can help them with a lot of those things.

And so, I think we are beginning to realize the benefits of some of the security areas. It always provides the opportunity——

Mr. SHUSTER. Did DOD say long-term——

Mr. BABBITT. Actually, DOD, from my perspective, did partner with us. We have got a good relationship with them, particularly DDO. It is a melting pot of information. I think it is actually very reasonable when we do some of the things that we are doing. There are a lot of stakeholders. We are talking about using a GPS, so a lot of people use GPS for a lot of different things. So, when we want to change it just for airplanes, a lot of other people go, whoa. Just the impact of what we use it for.

And so, we have got to have those places where we can have common dialogue and explain what the uses are, how they could better use it. Airlines are finding this flight object display really useful. They know a lot about the airplane—

Mr. SHUSTER [continuing]. LightSquared utilized like they want it to be? Do you have great concerns about it?

Mr. BABBITT. Well, I have great concerns about it. They are a company who proposes to build an infrastructure to take broadband across the United States. The original approaches to using satellite broadcast signal within GPS had no impact. They have since changed the business plan with ground base modification that had about 1,500 times more powerful a signal than [inaudible].

There is literally multiple, billions of dollars are invested, hundreds of billions of dollars invested in navigation systems, GPS equippage, and [inaudible] stations all over the world. And to jeopardize that because someone has a [inaudible] has us concerned.

So, I think the FCC has realized the interferences there. I think there are stations that could [inaudible]. I do not think anybody in industry thinks that is a good idea. So, we are sort of waiting for the FCC at this point.

We have spoken pretty strongly to DOD, Homeland, a lot of industry itself, people in manufacturing. It is kind of lonesome right now in finding support. We are concerned it will have an impact.

Mr. JOHNSON. Yes, Congressman. I want to point out that the implementation of the basic system is not a technology problem. The technology fundamentally is in place. Yes, we are doing some new software development for some new systems. But basically it is taking existent technology and integrating in a way that has not been integrated before to serve our needs.

I think that Ms. Blakey's comment about vision and about getting rid of silos and cooperating with each other are the real challenges. This is where we look to Congress, this committee, and to

the FAA to help us integrate and provide oversight, learn to share with one another.

But the basic technology is there. It is existent. We can develop the software. We have outstanding software engineering in this Nation. We can develop what is needed. Our private industries' research and development is par excellence, and we are moving forward aggressively. Technology is not the obstacle. It is the human dimension that we have got to address.

Mr. SHUSTER. I think my time has expired.

Mr. MICA. No problem. Mr. Farenthold.

Mr. FARENTHOLD. Thank you very much, Chairman. I had a couple of questions. We were talking a little bit about the integration of UABs into the domestic air system. We are seeing more and more UABs flying within this country now where we are using them not only to control the northern and southern borders, but also in the rescue operations and other life-saving operations.

Administrator Babbitt, are we going to be able to do this before NextGen? Are we going to end up having to wait to NextGen to see more integration of UABs within the domestic air system?

Mr. BABBITT. Well, it depends somewhat. I mean, certainly if we had, before we fleshed out, a NextGen system in place, it makes the operation a lot better. The fundamental concept with the UAB and deployment with [inaudible]. The answer to any of those is, no, it is not a good, cooperative maintenance.

So, we are making a lot of improvements to the autonomous operations and [inaudible]. There is the time between winning consensus and taking action and when it actually takes that action. It is way too large to be mixing with the normal airspace system. So, we sort of relegated it to airspace where we can provide that extra margin because it does not respond as quickly. And that will work for now.

We are working on reducing those margins, reduce the legacy times, improve the machine's ability to—and take actions.

So, I see wonderful machines. They do a lot of great things. If somebody just gets up out of the chair and nobody sits down. We can do a lot of interesting things.

Mr. FARENTHOLD. And, Mr. Caslavka, I know what GE is working on. When are you going to be comfortable with your family sitting in that 737 operating near one of those?

Mr. CASLAVKA. So, my perspective is you really have to roll out NextGen before you have the infrastructure in place to fly on top of those vehicles. You need trajectory-based operations to be functional. You need the data link communications back to the FCC. So, you really need to have those in place in order to feel safe on those vehicles.

It is important to note that they will have a role, we believe, at some point, whether it is border surveillance or search and rescue. They will have a space in national airspace. So, we need to roll out the infrastructures that provide for that.

And we are currently, as part of our initiatives here at Embry-Riddle, involved in a task that is going to view some of that initial testing of trajectory-based operations. So, that is part of the ongoing activity here at Embry-Riddle.

Mr. FARENTHOLD. All right. And, Mr. Bunce, you know, you represent folks in the general aviation industry. And in general, I would imagine they are going to be the last adopters of this NextGen technology when you are talking to obvious pilots, or the crop dusters, or the guy who flies his plane into his ranch.

I mean, we have got general aircraft now that do not have even transponders in there, mature technology. Is there a price point issue there? Are we going to be able to get enough of the general aviation folks in where we are able to really see the true benefit of some of this new technology?

Mr. BUNCE. Well, sir, I think it is a matter of degrees here. Actually general aviation has been the first adopter of a lot of this technology. So, you take, for instance, the types of GPS-based approached that we have populated this country with. In fact, the administrator talked last week at a speech I was listening to that we have reached a tipping point. There is actually more GPS-based approaches out there than there are the traditional instrument landing type of system approaches. That is because general aviation uses these.

We can get into airfields that we never possibly could have got into before because we have this technology, and we have integrated through our systems—why we are so concerned about life squared is because we have had so many of our airplanes adopt systems that can use what is called WAAS, which augments the GPS to allow us these precise approaches.

So, I would actually argue that there is a lot of general aviation that has more modern cockpits that some of the airplanes that I transit with on the airlines. I looked in a cockpit the other day on my iPad. I have more situational awareness of what the weather is ahead and where we are actually going than the poor pilot up there because just that, it is very expensive to upgrade those cockpits. So, the cost for ADS–B is starting to go down.

My wife flies a Cessna 172, very light basic airplane out there, so I equip with ADS–B. I have ADS–B out in the aircraft, and it cost me $600 more than what I had to put a new transponder in, and it integrates with the GPS system. So, it was about a $600 differential.

So, the cost is coming down, and it is reasonable, but we have got to be able to go and make sure that the benefits are there. And the real key in ADS–B is ADS–B in. And when we can start getting people to want to equip so that they can traffic, and they can get real time weather, we are going to make flying safer in this country. And that is really the golden goose right there is being able to get people to see the advantages of ADS–B in.

Mr. FARENTHOLD. And I will go back to you, Administrator Babbitt, just on a kind of, I guess, pushing the airlines into implementing the technology. You used LaGuardia as an example about how few aircraft come in there. We have got Washington, I know the DCA airspace is very crowded.

It seems like it is a carrot and stick approach—more slots in these airports, every plane you send in here is going to have to be equipped with this new technology. And there is no real Government requirement that you put it on your plane, but if you want

the hot airports, you are going to have to do it. Is that something you all are considering?

Mr. BABBITT. Well, we have considered it and actually implemented these things that require ADS–B, everything that is on the plane. We have not gone to, you know, particular airports. I think something Ms. Blakey said earlier is important, in terms of procedures, that we need have those developed in the areas, and then we will use them. For example, we have done it in the O'Hare area, the Chicago area. We have taken and separated the two airports, Midway and O'Hare, from each other. Earlier was one metroplex area. And so, if Midway Airport was operating at 60 percent of its capacity, and O'Hare was at 105 percent with major delays, well, Midway starts taking delays because it is the same airspace. Not anymore. We now allow people in RNP arrival procedures, they can go to Midway.

So, if you have the equipment, you can use the arrival, and you do not have to wait. You do not have the equipment, you wait. How many times are you going to hold and watch other people go by you because they have the equipment? The answer is not long.

I think it is important to note for general aviation, we do not want people to buy equipment they do not need. If you intend to operate a pilot in controlled airspace, you do not need to buy it. There are people today that have airplanes that do not even have radios in them, flying around their farms. They never get above 1,500 feet. They are good pilots that and that is their mission. Fine, you can keep it that way. We want people to be equipped to the level of the operation that they are working towards.

Mr. FARENTHOLD. All right. Thank you very much.

Mr. MICA. Ms. Adams.

Ms. ADAMS. Mr. Babbitt, I noticed as Dr. Johnson was talking, you were shaking your head in agreement, and that was nice to see. I wanted to just put that out there.

Mr. BABBITT. He was talking nicely about me.

[Laughter.]

Ms. ADAMS. Mr. Bunce's written testimony, I do not know if you had a chance to review it, but he writes about the importance of research and development for FAA and NASA. And so, I want to know, what is FAA doing with NASA R&D to leverage NextGen?

Mr. BABBITT. Well, we have several programs that we are a part of JPDO. We interface with them. Actually, there was a provision that we were seeking to expand. We have taken responsibility for commercial space with sort of our old launches and so forth. We are trying to capture some of the expertise [inaudible] where we would take some of the folks who have been working [inaudible] think about a lot of what NextGen is built on today came from [inaudible] navigation space. That is the ultimate force now navigation [inaudible].

Mr. DILLINGHAM. I just wanted to add that while we were doing our work in tech transfer, the JPDO, which is composed of the Federal agencies that are part of the long-term research and development for NextGen, the strongest partnership we found was NASA in terms of tech transfer. They have a long history of working together, and their research transition teams are sort of what we put up as kind of a model that other agencies might want to use in

working with FAA. So, NASA is the strongest partner that we found.

Ms. ADAMS. And, Dr. Johnson, I want to give you a chance. Again, kind of tell us the unique opportunities that you have that are derived from FAA's partnership.

Mr. JOHNSON. Thank you, Congresswoman Adams. I appreciate that. We have worked closely with the FAA. And we very much appreciate it. We have worked with a lot of administrators, and we have had very good relationships with them.

We work closely with the FAA in trying to ensure safety in our Nation's airspace. And, of course, we are very proud to have Administrator Babbitt as an alumnus of Embry-Riddle, and we know that the FAA is in safe hands because of that.

I would like to make a comment about GAMA and general aviation. I hope there is not a misconception that somehow general aviation is not at the cutting edge of technology. We have a lot of relationships with general aviation companies. For example, we offer degree programs for Gulfstream in Savannah, and we work with them on the development of composites and advanced avionics.

When you look at Embry-Riddle's fleet, if you look at the avionics in our small planes, like the Diamond 42, for example, you will find that that avionics package is as good, if not better, than most commercial airliners in our country.

So, general aviation is at the forefront in terms of the development of a lot of technology that would be very appropriate to making NextGen a reality and make our skies safer. I want to compliment GAMA and their work, as well as the AOPA and their efforts.

Ms. ADAMS. I think that he is recognizing that there is this unique opportunity between FAA and NASA as they gather on the commercial space industry. And I think that is probably what—and, Mr. Bunce, we want to hear further—the written testimony was about, was the fact that they have a unique opportunity.

Mr. BUNCE. Yes, ma'am. Over the last several years, that budget has been whacked significantly. In fact, we partnered with FAA a couple of years back to say, you know, put the egg back in NASA, because as their budget was really getting squeezed, aeronautics started to drop out. And there was an initiative a couple of years back actually to take all aeronautics funding, R&D funding, and just give it to all to the FAA. And we were partners with the FAA there to say, no, that is not smart to do because there are things, as the administrator pointed out, that NASA does extremely well that we want to tap into. And that is why this partnership is something we would actually like to see expanded.

But we all know in the fiscal environment that we are in right now, we have to leverage the best, and there are a lot of smart people just over there near the Cape that we would love to be able to see in the Government and industry to tap into that expertise. They do data com better than anybody on the planet, and we need to tap into the way they do it.

Ms. ADAMS. I agree that we have got a lot of very smart people out there. And I would like to continue the aerospace part of [inaudible].

Ms. Blakely, I listened and I was a little dismayed at the fact that DHS does not seem to play an active role in what you appear to have witnessed. Based on their own mission statement, I believe that homeland security is their mission statement. I am hoping that, Administrator Babbitt, you can help us to figure out a way to encourage them to be more active and involved as we move forward because there are some concerns that have been raised by this panel, and I am sure concerns on this committee.

Mr. BABBITT. We will certainly make those efforts. As I said, I think we have made some progress. You know, the fact that they saw the mission that they had, the organization. I think they had some sort of getting in place structural issues that probably help any of us. [Inaudible] was lacking, we would say. So, I am beginning to see some better communicating line has been developed. I think they appreciate—we have a lot of expertise we could help them with, and they have a lot of information that we could use and benefit all of us. So, we will keep working on it.

Ms. ADAMS. And just a quick comment. Dr. Dillingham, thank you for your information, for saying it is more validation of research than duplication, because that is important that we know that. Thank you. Thank you, Mr. Chairman.

Mr. MICA. I will call on our minority counsel. Did you have any questions?

Mr. BURKETT. Mr. Chairman, you are very kind, but I do not think I have any questions. Thanks.

Mr. MICA. What we will do, since we have Members who may have additional questions, in consultation with the minority, we will leave the record open for a period of 2 weeks for additional questions, which we may submit to the panelists.

Well, I want to thank everyone for participating, for taking time out of your busy schedules to be with us, and for the cooperative effort in moving next generation air traffic control forward.

Again, we thank Embry-Riddle. I want to also thank, in addition, Dr. Johnson and Dr. Recascino, one of the officers at the university, who has helped us both with the Test Beds and this hearing, but also with accommodating some of the meetings that will take place among some of the private, public, and academic players in bringing this important phase of next generation air traffic control forward.

With that, again, I want to thank our Members for attending, and the staff for their assistance in making this fairly historic hearing possible. And on the eve hopefully of us passing long-term FAA reauthorization and will incorporate some important provisions to make certain that the United States stays at the forefront both as far as the systems, next generation, and particularly for aviation safety that is so important for the traveling public.

Somebody said to me yesterday, sort of summed it up. He said, it looks like you all are here to take our air traffic control and aviation system from World War II era to the 21st space age, and that sort of sums up the purpose of our being here.

I invite to participate at 2:00. We will have some brief commentary, opening of the new Test Bed facility, and then there will be tours made available, and some actual operational demonstration for all those who care to attend. So, that will be at 2:00. And

if you aren't with where the facility is, it is right—if you are looking at the terminal, it is the building right to the left. I saw it this morning. There is a white tent out in front. But you all are welcome to participate in that. Thank you again.

There being no further business before the Transportation and Infrastructure Committee, this hearing is adjourned.

[Whereupon, at 12:00 p.m., the committee was adjourned.]

STATEMENT OF THE HONORABLE J. RANDOLPH BABBITT, ADMINISTRATOR, FEDERAL AVIATION ADMINISTRATION BEFORE THE COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE ON LEVERAGING PUBLIC, PRIVATE, AND ACADEMIC RESOURCES, NOVEMBER 7, 2011.

Chairman Mica, Congressman Petri, Members of the Committee:

Thank you for the opportunity to appear before you to highlight the capabilities of the Florida NextGen Test Bed and to discuss the benefits of the Next Generation Air Transportation System (NextGen). This facility represents an exciting expansion of the Federal Aviation Administration's (FAA) NextGen Test Bed environments, and I am pleased to be able to join you here in Florida. The Administration is prioritizing NextGen development and implementation, and the recent renovations at the Florida Test Bed are just one of many recent NextGen-related initiatives and milestones.

In September, the President requested $1billion in the American Jobs Act for NextGen to support applied research, advanced development and implementation of solutions for NextGen technologies, applications and procedures. This additional investment in NextGen underscores the Administration's commitment to the future of our aviation system. More recently, in mid-October, the President officially welcomed a NextGen project – for NextGen procedures in the Houston metroplex - as part of his High Priority Infrastructure projects for expedited review. That same day, the President's Council on Jobs and Competitiveness delivered an interim report that included a recommendation to accelerate NextGen performance-based navigation procedures. This focus and prioritization, when coupled with advances in technology and research capabilities

provided by facilities like this one at the Daytona Beach Airport, are the key to hastening the realization of all that NextGen has to offer.

The FAA's three NextGen Test Beds provide real-world testing and demonstration environments to facilitate research and development. The Test Beds facilitate integration of individual flight information in order to create a simulated NAS environment and to enable end-to-end demonstrations and evaluations. The FAA's NextGen Test Bed environment is comprised of the William J. Hughes Technical Center near Atlantic City, New Jersey; this facility, the Florida NextGen Test Bed at Daytona Beach International Airport; and the field laboratory at the National Aeronautics and Space Administration (NASA)/FAA North Texas facility at the Dallas/Fort Worth International Airport. These environments provide the FAA with a broad range of resources for the development of NextGen concepts and technologies.

Today, we are marking the completion of renovations and enhancements to the Florida NextGen Test Bed which will ensure that the facility is equipped to handle the tests and demonstrations of today and prepared to accommodate the ideas and innovations of tomorrow. Currently, the facility houses more than a dozen systems, and what you see in place today is just the beginning. The Florida Test Bed will be continually modified over the coming months and years as new demonstrations and technology evaluations are completed and additional air navigation platforms and programs are imagined and engineered.

This is a facility that will provide both government and industry the ability to examine proposed systems for NextGen operational improvements in an environment that permits integration with the full range of NextGen systems and allows evaluation of impacts to operations. We also expect that the Florida Test Bed will act as an open evaluation platform to analyze the feasibility of new technologies and that this facility will be the birthplace of industry-identified and industry-driven concepts to further the progression and increase the benefits of NextGen. We look forward to the great new technologies that the Test Bed's capacity for innovation, early prototype testing, and demonstrations, coupled with access to the resources at Embry-Riddle Aeronautical University, are sure to yield.

Generally, it is anticipated that technology and procedures demonstrated at the Florida Test Bed will provide insight into the feasibility, potential benefits, and potential costs that then inform whether the concepts should be further pursued for possible implementation. If pursued, the acquisition process would then ensure that appropriate requirements and cost-benefit analyses are developed to find the best solution for integration into the National Airspace System (NAS). This reduces cost, schedule impact, and risk before embarking on a program, and may help shape the best path ahead.

Since 2008, the FAA has awarded $22 million toward NextGen-related research and development activities under our Other Transaction Agreement with Embry-Riddle Aeronautical University. This agreement enables the FAA to leverage the experience and expertise of the Florida Test Bed's seventeen industry partners and has resulted in

NextGen solutions that are the product of industry collaboration and which have been proven successful enough to move toward implementation. During an Unmanned Aircraft Systems (UAS) demonstration we used NextGen Voice System technologies to show how UAS pilots and controllers could improve communication performance during long distance operations. Results from the testing enabled us to include requirements for this capability as part of our initial contractual market survey. Demonstrations aimed at improving integration of weather with our automation tools, were translated into technical requirements that are part of our NextGen Weather Processor (NWP) and NextGen Network Enabled Weather (NNEW) programs. Finally, a set of progressive, multi-domain demonstrations focused on defining Flight Data Objects has provided tremendous insight on the type of flight data information that will be needed to support Trajectory Based Operations across multiple automation platforms.

Altogether, about twenty activities have been performed that span the terminal, enroute oceanic, and human factors arenas, with over fifty demonstrations of those activities conducted for various industry, government, and academia stakeholders. These activities have also involved collaboration with other United States Government agencies such as the National Aeronautics and Space Administration, the Air Force, and Customs and Boarder Protection, as well as our international counterparts such as Airservices Australia.

In the coming years, we expect to see even more exciting developments here in Daytona Beach as we implement planned activities which will provide live NAS data to support demonstrations and will enable information sharing with other Test Bed sites and remote

NextGen partners. We look forward to these and other changes as the Florida Test Bed continues to evolve.

Although we are all pleased to be here in Florida to cut the ribbon on this newly-renovated building and to witness demonstrations of the cutting-edge systems that are up and running in the Test Bed environment, this event should be more than just a celebration of what we have accomplished. Today, we are calling on our industry partners to take advantage of the promise of the public-private partnership represented by facility.

As we look to the future of this place, we also look forward to the evolution of our air transportation system and must take the opportunity to remember the long-term benefits we are working towards. NextGen is a comprehensive overhaul of the NAS that will make air travel more convenient and dependable, while improving safety and efficiency. In a continuous roll-out of improvements and upgrades, the FAA is building the capability to guide and track air traffic more precisely and efficiently to save fuel and reduce noise and pollution. NextGen is a better way of doing business – for the FAA, the airlines, the airports, and the traveling public. It's better for our environment, better for efficiency and flexibility, better for safety, and better for the economy.

In 2009, civil aviation contributed $1.3 trillion annually to the national economy and constituted 5.2 percent of the gross domestic product, according to FAA's most recent report on the economic impact of civil aviation. It generated more than 10 million jobs,

with earnings of $397 billion. NextGen is vital to protecting those contributions. The current system simply cannot accommodate anticipated growth in the aviation industry. Congestion continues to increase at many of our nation's busiest hub airports, a problem that will only be exacerbated now that traffic levels are starting to rebound from the impact of the economic recession.

Between 2007 and 2011, approximately $2.8 billion has been appropriated for NextGen. The FAA estimates the development of NextGen will require between $15 and $22 billion from 2012 to 2025. These figures represent important investments with substantial returns. Our latest estimates show that by 2018, NextGen air traffic management improvements will reduce total delays, in flight and on the ground, by approximately 35 percent, compared with what would happen if we maintained our current system. This delay reduction will provide $23 billion in cumulative benefits through 2018 to aircraft operators, the traveling public, and the FAA. Additionally, we will save about 1.4 billion gallons of aviation fuel during this period, cutting carbon dioxide emissions by 14 million tons.

To fully understand the impacts of our ongoing efforts, it is important to highlight some examples of where NextGen is already improving safety and adding real dollars to the bottom line:

- Using Automatic Dependent Surveillance-Broadcast (ADS-B), a GPS-based technology, aircraft are able to fly more safely and efficiently in previously challenging areas. ADS-B equipped helicopters flying over the Gulf of Mexico are benefiting from radar-like air traffic services for the first time. ADS-B radio stations deployed along the shoreline and on oil platforms blanket the area with

air traffic surveillance, increasing the safety of operations. This same surveillance improves efficiency in the Gulf through more direct routing of ADS-B equipped helicopters, reducing both their operating cost and environmental impact. In Colorado, new surveillance technologies are enabling controllers to track aircraft flying through challenging mountainous terrain. Currently, over half of ADS-B ground infrastructure has been deployed.

- Southwest Airlines started using GPS-based Required Navigation Performance (RNP) approaches at a dozen airports this year. The airline says that it could save $25 for each mile they save by using a shorter route.

- Alaska Airlines has been a leader in using RNP approach procedures at Juneau International Airport. They can fly precisely through mountainous terrain in low visibility conditions thanks to the higher navigational accuracy of GPS. The airline estimates it would have cancelled 729 flights last year into Juneau alone due to bad weather if it were not for the GPS-based RNP approaches.

- In Atlanta, Delta Airlines reports saving 60 gallons of fuel per flight by using the more efficient descent procedures we have designed under NextGen. Aircraft descend continually to the runway with engines idle, as opposed to descending in a stair-step fashion, using the engines and burning fuel to power up at each level-off point.

- We conducted Initial Tailored Arrival (ITA) flight demonstrations at San Francisco, Los Angeles, and Miami and have now progressed to operational capability in all three locations. ITAs are pre-negotiated arrival paths through airspace of multiple air traffic control facilities; they limit vectoring and minimize the time the aircraft spends maintaining level flight during its decent. ITAs differ from other types of Optimized Profile Descents (OPDs) in that they are assigned by controllers to specific approaches and tailored to the characteristics of a limited number of FANS-equipped aircraft types – 747s, 777s, A330s, A340s and A380s. We estimate that the 747s saved an average of 176 gallons of fuel per arrival in ITAs and 78 gallons per flight in partial ITAs, compared with conventional approaches. For 777s, the corresponding savings were 99 gallons in full ITAs and 43 gallons in partial ITAs.

We anticipate seeing additional benefits in the near term. The "Greener Skies over Seattle" initiative should save literally millions of gallons of fuel annually, cut noise, and decrease greenhouse gas emissions. The FAA estimates that airlines using RNP procedures at Seattle Tacoma International Airport will save several millions of dollars per year at today's fuel prices. And that number is only going to get larger as more

airlines equip. With the "Greener Skies over Seattle" initiative, aircraft will emit less carbon dioxide – about 22,000 metric tons less per year. That's like taking more than 4,000 cars off the streets of the Seattle region.

These are just a few of the benefits that we are seeing already from our investments. However, we cannot afford to be short-sighted. A true transformation in the way we deliver air traffic services takes planning and time, and the long-term benefits offered by this new way of doing business – safety, efficiency, access, decreased environmental impact – must always be at the forefront.

NextGen operation capabilities will make the NAS safer. ADS-B improvements in situational awareness, on the ground and in aircraft, will increase controllers' and pilots' individual and combined ability to avoid potential danger. Among other benefits, this could provide valuable time savings in search and rescue efforts. Appropriately equipped aircraft will be able to receive information displayed directly to the flight deck about nearby traffic weather, and flight-restricted areas.

More precise tracking and information-sharing will improve the situational awareness of pilots, enabling them to plan and carry out safe operations in ways they cannot do today. Air traffic controllers will become more effective guardians of safety through automation and simplification of their most routine tasks, coupled with better awareness of conditions in the airspace they control. Additionally, NextGen will facilitate the

implementation of Safety Management System processes for the air traffic controllers' use.

Advances in tracking and managing operations on airport surfaces will make runway incursions less likely. Fusing new surface radar coverage now in use at 35 airports with ADS-B surveillance of aircraft and ground vehicles will increase situational awareness, particularly when linked with runway status lights. Collaborative decision making will increase everyone's understanding of what others are doing.

Starting with pre-takeoff advisories, departure instructions, and reroutes for pilots, we will use data messaging increasingly in favor of voice communications between pilots and controllers, reducing opportunities for error or misunderstanding. Voice channels will be preserved for the most critical information exchanges.

As with safety, our work to enhance aviation's influence on the environment also benefits – and is a beneficiary of – NextGen. The operational improvements that reduce noise, carbon dioxide, and other greenhouse-gas emissions from aircraft are the tip of the FAA's environmental iceberg. Equally important are the other components of the agency's environmental approach - aircraft and engine technology advances, sustainable fuels, policy initiatives and advances in science and modeling.

Environmental benefits of operational improvements are simple and direct. When we improve efficiency in the NAS, operators almost always save time and fuel. Burning less

fuel produces less carbon dioxide and other harmful emissions. Some of our NextGen improvements, notably approaches in which aircraft spend less time maintaining level flight and thus can operate with engines at idle, reduce ground noise too. But operational benefits go only so far; their net system-wide effect can be offset by growth of the aviation system.

To accommodate system growth, we are supporting development of aircraft, engine, and fuel technology. In 2009, we established the Continuous Lower Energy, Emissions and Noise program to bring promising new airframe and engine technologies to maturity, ready to be applied to commercial designs, within five to eight years. Similarly, we are part of a government-industry initiative, the Commercial Aviation Alternative Fuels Initiative, to develop sustainable low-emission alternative fuels and bring them to market.

We have developed and are using the NextGen Environmental Management System (EMS) to integrate environmental protection objectives into NextGen planning and operations. The EMS provides a structured approach for managing our responsibilities to improve environmental performance and stewardship. We also are analyzing the effect on aviation environmental policy and standards, and of market-based measures, including cap-and-trade proposals.

Additionally, many airports will benefit from substantial improvements in efficiency, access, surveillance, environmental benefits, and safety. Surveillance, situational awareness, and safety will improve at airports with air traffic control radar services as we

deploy ADS-B ground stations across the NAS and update our automation systems, and as operators equip their aircraft for it. The FAA also plans to publish Wide Area Augmentation System Localizer Performance with Vertical Guidance (LPV) approach procedures for all suitable runway ends by 2016.

We are making important progress on a number of efforts to show how better situational awareness and pacing on the ground will give operations and the traveling public more reliability and save them time, while also managing environmental impacts. We can cut fuel consumption and emissions by reducing the time and number of aircraft idling on taxiways waiting for takeoff, or for open gates slots upon arrival. Also, we can reduce equipment wear -- stop-and-go accelerations are hard on engines and other parts, and they also increase the emissions of carbon dioxide into the atmosphere.

A major success in 2010 was the minimal disruption that occurred during a four-month runway resurfacing and widening project in one of the nation's busiest airspaces. The longest runway at New York John F. Kennedy International Airport (JFK) had to be expanded to accommodate new, larger aircraft. The project also included taxiway improvements and construction of holding pads. To minimize disruption during construction, JFK's operators turned to a collaborative effort using departure queue metering, in which each departing aircraft from JFK's many airlines was allocated a precise departure slot and waited for it at the gate rather than congesting taxiways. The procedure limited delays so well, it was extended after the runway work was completed.

Surface initiatives like these make important contributions across the board -- they improve situational awareness and safety, they reduce fuel consumption and carbon dioxide emissions and they reduce tarmac delays – in addition to making a real difference for aircraft operators and passengers.

The benefit for aircraft operators in the NAS will come from two major categories of improvements – efficiency and capacity, and access. Much of the time, efficiency and capacity go together. When we reduce the distance needed for the safe separation of aircraft, reduce delays from weather and other disruptions, and increase flight-path and procedures options for controllers as they maintain the flow of traffic, we improve capacity as well.

Access issues center on runways at major airports, affecting mainly airlines, and airports and airspace that lack radar coverage, a problem for general aviation. NextGen will improve efficiency in operations that involve closely spaced parallel runways and converging and intersecting runways. Area Navigation (RNAV) and Required Navigation Performance (RNP) are improving efficiency and capacity in departures and approaches. For general aviation, ADS-B will enable controllers to track properly equipped aircraft in non-radar areas covered by ADS-B ground stations. General aviation operators equipped for ADS-B In will receive traffic and weather information directly in the flight deck, providing them with greater situational awareness. Wide Area Augmentation System LPV approach procedures will give properly equipped aircraft Instrument Landing System (ILS)-like capability at non-ILS airports. Through our new NAV-Lean process,

we are working to streamline the development and implementation of new instrument procedures to ensure that users can benefit from them as quickly as possible. We plan to accelerate design and implementation of Performance Based Navigation procedures and optimized descents to achieve their benefits sooner rather than later.

Just last month, the FAA, in collaboration with airlines in Chicago, used an RNP approach to Midway, de-coupling Midway operations from O'Hare. By doing so, O'Hare was able to maintain operations at 92 airplanes an hour, with no additional delays, while landing airplanes at Midway. Had the procedure not been deployed, the ground delay program would have limited O'Hare to 68 airplanes per hour.

Optimization of Airspace and Procedures in the Metroplex (OAPM) is a systematic, integrated and expedited approach to implementing Performance Based Navigation (PBN) procedures and associated airspace changes. This program was developed in direct response to RTCA Task Force 5 recommendations on the quality, timeliness, and scope of metroplex solutions. OAPM focuses on a geographic area, rather than a single airport. It considers multiple airports and the airspace surrounding a metropolitan area, including all types of operations (air carrier, general aviation, military, etc.), a well as connectivity with other metroplexes.

The OAPM process uses two types of collaborative teams including FAA and industry partners. Study Teams recommend conceptual airspace and procedure solutions, and then Design and Implementation (D&I) Teams design, refine, review, and implement those

recommendations within a near-term three-year timeframe. To date, 21 Metroplex sites have been identified and prioritized with input from FAA and industry. Study Teams have completed their activities in Washington, DC, North Texas, Charlotte, Northern California and Houston. Study Teams are nearing completion in Southern California and Atlanta. Identified potential benefits ranging from $6M to $26M per year have been estimated at each site. D&I activities are in process in the Washington, DC metro and North Texas locations with additional projects soon to follow in Houston Atlanta, Charlotte, Northern California, and Southern California.

In order to achieve these benefits, we know that we need to continue working with our partners in the aviation community. Making sure that we are all on the same page about our expectations, our obligations, and our capabilities is essential to the successful planning, development, and execution of NextGen. In recognition of the need for clarity and transparency, the Administration, in conjunction with the airlines, is actively developing new PBN dashboards that will provide additional information on the use of high value procedures that are already deployed and also clarify the development status of high value new procedures around the country.

The FAA continues to expand its work on demonstrations, trials and initial deployment of NextGen systems and procedures. NAS operators and users – particularly participants in the demonstrations and trials – are benefiting from them. But there is a chicken-and-egg nature to the economic and policy decisions that will have the most influence over the extent and timing of future benefits.

On the one hand, achieving NextGen's benefits depends heavily on aircraft operators and other stakeholders investing in the avionics, ground equipment, staffing, training, and procedures they will need to take advantage of the infrastructure that the FAA puts in place to transform the aviation system in the coming decade and beyond. On the other hand, the willingness of operators and other stakeholders to make these investments depends critically on the business case for them – analyses of how valuable these benefits will be, and that they have confidence that the FAA can deliver the infrastructure in the time frames and manner required for those benefits to be realized.

When costs are clear but benefits are even slightly cloudy, there is an important information gap which the FAA must help fill. We are working to do this in two ways. First, we conduct broad, system-level analyses, estimating how integrated NextGen benefits will develop and grow over a period of years. This work draws on modeling and simulations of how NAS operations will change and what effects the changes will have. The FAA must continue to work closely with the aviation community to ensure these benefits are well understood by those who need to invest in NextGen.

Second, using facilities like the Florida NextGen Test Bed, we conduct a wide range of demonstrations and operational trials of specific NextGen systems and procedures. These demonstrations, conducted in real-world settings by operations and development personnel using prototype equipment, are invaluable. They provide all of the stakeholders with the opportunity to see the very real benefits that NextGen can bring. They mitigate program risks and show us whether we are on the right track in our technical approaches.

They provide valuable insight into how equipment should be designed for operability, maintainability, and a sound human-automation interface. And they are instrumental in advancing our understanding of the benefits to be gained from the capabilities being demonstrated.

Information from the demonstrations also helps us refine our models of NAS operations and how these operations will change, along with the corresponding overall estimate of NextGen benefits. Further, it provides direct measurements of the ways specific NextGen capabilities can benefit NAS stakeholders and the public, enabling stakeholders to improve their own estimates of the benefits and costs of buying equipment for NextGen and to be more confident of their analyses.

We are working steadily and carefully to bring NextGen to fruition. We are hopeful that the Florida NextGen Test Bed, in conjunction with our other testing environments, will spur innovation and collaboration by and with industry, and hasten the realization of the multitude of benefits NextGen has to offer.

Mr. Chairman, this concludes my prepared remarks. I would be pleased to answer any questions you may have.

Field Hearing

House Committee on Transportation and Infrastructure

"NextGen: Leveraging Public, Private and Academic Resources"

Embry-Riddle Aeronautical University, Daytona Beach, Florida

November 7, 2011

Marion C. Blakey, President and CEO

AEROSPACE INDUSTRIES ASSOCIATION

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Introduction

Chairman Mica, first let me thank you for the invitation to be part of this important hearing, and part of this important event, as you unveil the Florida NextGen Test Bed later today. I was here about 16 months ago, and the progress that has been made is remarkable. This is another significant chapter in the illustrious history of Embry-Riddle Aeronautical University, continuing its long service to FAA and to our nation.

The Aerospace Industries Association (AIA) is the premier trade association for the aerospace and defense industry, representing over 340 aerospace and defense manufacturing companies and the industry's one million highly-skilled employees. Our companies manufacture the aircraft that fly in the world's airspace, the ground-based navigation aids and communications systems that help controllers guide these aircraft, the maintenance systems and repair parts that keep the system going, and the satellites and unmanned aircraft that are the wave of the future for our airspace system. Our member companies are vitally interested in seeing NextGen succeed.

The Status of NextGen

Mr. Chairman, your committee recently held a hearing in D.C. on the overall status of FAA's NextGen program. And what resonated from this hearing was a need for stronger coordination with the private sector, including the airlines and the manufacturers of NextGen equipment. There is no question about the cost-benefit of NextGen, as you know. Tom Captain of Deloitte Touche captured it perfectly when he said in that hearing that NextGen has "an open and shut business case". Yet even as ITT rolls out more ADS-B ground stations, and airlines equip more

of their aircraft with NextGen-capable avionics, we are not yet realizing the full value of these benefits. We hope that FAA will take note of the spirit of public-private partnership here in Florida and apply it to other areas such as procedures development and UAS integration. In short, there is more work to be done.

To its credit, FAA is taking steps to respond to these challenges. The agency reorganized its NextGen management team and raised its organizational priority. They continue to incrementally improve the NextGen Implementation Plan. We know NextGen is a priority of the agency, but we also know the coming budget challenges will make it harder for NextGen to stay on track. The discretionary caps in the Budget Control Act call for agency budgets that average only a 1.6 percent increase each year for the next decade. As if that weren't difficult enough, we may see further reductions when the Joint Select Committee on Deficit Reduction issues its recommendations later this year.

Mr. Chairman, FAA is primarily an operating agency. And we all know that when operating budgets get pitted against transformational capabilities, it is usually the operating budgets that win out. OMB Director Jack Lew recently wrote to the Chairman of the Senate Appropriations Committee setting out the Administration's top funding priorities for FY12 appropriations bills. FAA and NextGen funding were only mentioned in passing. As the budget gets tighter, FAA's role in explaining and showing NextGen's benefits will become even more important. Likewise, AIA will do its part in that education campaign, to make sure that our aviation system remains second to none.

The Importance of Effective Public-Private Partnership

Mr. Chairman, the National Airspace System is a highly complex entity, a ballet of sorts that plays out each day in our skies and at our airports. It involves the elaborate planning, coordination and execution of many separate elements – flight crews, dispatchers, airports, general aviation pilots, and air traffic controllers, to name just a few. For FAA to provide efficient, modern air traffic control services, the agency must have the participation, cooperation, and investment of private industry. If FAA doesn't modernize, our economy suffers and our aviation system loses its competitiveness. But if industry is not a partner in the design and implementation of these improvements, the FAA's investment is wasted.

Now many federal programs provide broad social benefits, and air traffic control does that as well. But ATC also provides business-like benefits to critical parts of the U. S. economy, something relatively rare in the Federal Government. Inefficiencies in FAA's management of the air traffic control system, or lack of capital investment, have a direct impact on industry and stifle its ability to compete. The agency must simultaneously keep one eye on the health of the aviation system as a whole – and the other on being an effective partner with industry, keeping commerce flowing and passengers arriving at their destinations in an efficient manner.

The Florida NextGen Test Bed

Mr. Chairman, there is no better institution to assist FAA in this effort than Embry-Riddle. It is no exaggeration to note that Embry-Riddle is the world's largest, oldest, and most prestigious university specializing in aviation and aerospace matters. They have advised the FAA for over 30 years, and currently house the Center of Excellence for General Aviation Research. Embry-Riddle offers the test bed access to professors, retired controllers, and pilots, as well as the

university's fleet of over 90 aircraft. It is a national treasure, to be sure, and I counted on their advice when I served as FAA Administrator.

FAA and its industry partners require an environment where NextGen concepts and technology are tested and evaluated without affecting the day-to-day operations of the air traffic control system. The agency needs to model, simulate, and verify new concepts and technologies under different scenarios. These results will help the FAA make data-driven decisions that speed up NextGen's implementation.

Three years ago, FAA recognized that Embry-Riddle was the best organization to manage this program and Daytona Beach was the right location. Since that time, I understand you have doubled the size of the test bed and vastly increased its software and tracking capabilities.

Industry participation has likewise increased, to at least 15 active companies including Lockheed Martin, Saab Sensis, Harris, and Boeing. Industry has invested at least $1 million of their own in the test bed. That is a clear sign of industry confidence in what you are doing here. And it is a great example of public-private partnership -- companies, academia, and the federal government working and jointly funding a program to address important challenges.

Mr. Chairman, the aviation industry is clamoring to receive NextGen's benefits *today*. For that reason, it is important for the test bed to focus specifically on the validation of R&D concepts that can be rapidly implemented over the next few years. It is vitally important to accelerate the benefits of NextGen to both commercial and general aviation users over the next few years. I believe the test bed can -- and will -- play an important part in that effort.

It is equally important for the test bed to focus on the most pressing NextGen problems. These include convective weather, surveillance, runway incursions, and unmanned aerial systems. These are areas where Embry-Riddle researchers are already working in collaboration with industry partners and the FAA. When I look at some of NextGen's most important programs, like ADS-B and SWIM, I see that the NextGen Test Bed is already involved. I am pleased to see that the test bed's work plan is focused in the right areas.

Conclusion

Mr. Chairman, we have recently been celebrating the life of Apple co-founder Steve Jobs. With his inventive genius, Jobs helped untether the world from the wires of mainframes, landline telephones, and CD changers. And that's exactly what NextGen promises to do for aviation. It promises to untether air traffic control from ground radars, phone lines, and voice switches. It promises to untether aircraft from the fixed airways they fly through today, allowing them to fly routes that are most efficient for their users.

Just as Steve Jobs saw that the world of consumer electronics was ready to move beyond boundaries set in the 1960's, so too is the world of aviation. In fact, the aerospace industry is chafing at those bonds today. So it's exciting to be here as Embry-Riddle helps make the vision of NextGen a reality.

Testimony of Peter J. Bunce
President & CEO
General Aviation Manufacturers Association

Before the Committee on Transportation and Infrastructure
United States House of Representatives

NextGen: Leveraging Public, Private and Academic Resources
Willie Miller Instructional Center Auditorium
Embry-Riddle Aeronautical University in Daytona Beach, Florida

Monday, November 7, 2011

Chairman Mica and members of the committee, my name is Pete Bunce and I am the President and CEO of the General Aviation Manufacturers Association (GAMA). GAMA represents over seventy of the world's leading manufacturers of general aviation airplanes, engines, avionics, and components. Our member companies also operate aircraft fleets, airport fixed-based operations, pilot training and maintenance facilities worldwide.

On behalf of our members, I appreciate your convening this hearing and providing me the opportunity to testify before the Committee about the role of NextGen and the importance of leveraging public, private and academic resources. It is important that we explore this topic as we all readily acknowledge federal budgets are constrained, meaning we need to be creative in finding ways to partner all resources, including those in the private sector and academia, to ensure we can maintain and grow our nation's aviation sector.

I'd also like to thank Dr. Johnson and Embry-Riddle for hosting us today, as well as publically acknowledge the valuable contributions that have been made by the university to the aviation sector, including the NextGen Test Bed that is going to be unveiled later today. GAMA member companies have expressed both interest and positive reviews of the Test Bed and I am certain that it will continue to be a foundation for NextGen advancements.

Overview of General Aviation

General aviation (GA) is an essential part of our transportation system and is especially critical for individuals and businesses that need to travel and move goods quickly and efficiently in today's just-in-time market. GA is also an important contributor to the U.S. economy, supporting over 1.2 million jobs.[1] In 2010, U.S. general aviation airplane manufacturers delivered 1,334 airplanes.[2] The total value of these aircraft was $7.9

[1] General Aviation's Contribution to the U.S. Economy, MergeGlobal, 2006.
[2] 2010 General Aviation Statistical Databook and Industry Outlook, GAMA 2011.

billion, with 62 percent of that value tied to exports.[3] We are one of the few remaining manufacturing industries that still provide a significant trade surplus for the United States.

Despite the recent economic downturn, general aviation has also been among the most successful industries at creating highly-paid, well-skilled jobs that our economy needs. It is important that Congress and the Administration adopt policies that help GA to remain competitive and continue to be a leading contributor to our export base.

Our member companies have responded to the economic downturn by continuing to innovate and invest in new products to take advantage of market opportunities as the recession ends. We see indicators that the market is beginning to stabilize and also see an increase in orders in some segments of our industry. We believe that this Committee has a key role to play in helping our industry take full advantage of their investments and innovations.

Importance of FAA's R&D Program and Research Centers

Research and development at the FAA is conducted within two separate programs: the research, engineering and development program (RE&D), and the facilities and equipment (F&E) program.

The FAA focuses its research activities on aviation safety, air traffic control modernization, and the environment to advance agency policies and to guide future technologies and understand safety issues facing the aviation system. The FAA's research program has become more important recently as the National Aeronautics and Space Administration's (NASA) aeronautics budget has been cut dramatically over the past ten years. As a result, some policymakers have debated shifting all federal aeronautics research to the FAA.

GAMA opposes this idea because the two agencies have quite different capabilities, missions, and goals. Moreover, during debate on its FAA reauthorization bill, the Senate voted overwhelmingly against commissioning a study to determine the feasibility of transferring NASA's aeronautics program to the FAA. However, with respect to air traffic control modernization and other areas, it is very important that the two agencies coordinate their research programs and work closely together.

Further, each of us here today is aware of the FAA research initiatives conducted at the William J. Hughes Technical Center (Tech Center) in Atlantic City, New Jersey and the Civil Aero Medical Institute (CAMI) in Oklahoma City, Oklahoma. Each facility brings its own unique capabilities to support the FAA's mission, and both are globally recognized as world class research centers for aviation safety, technology and environment. GAMA wholeheartedly supports these efforts, as they yield dividends that benefit the entire aviation sector.

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[3] IBID

Next Gen Research

Air traffic control modernization, or NextGen, will transform the National Airspace System (NAS) by using modern technologies to make air travel safer, more efficient, and expand capacity. We believe that the current impediment to accelerating NextGen is not a lack of technology but the inability to develop processes and procedures that will support this technology. To do this, FAA must leverage its research resources through both the RE&D budget and the F&E account. During the past two years, with direction from Congress, the FAA has undertaken specific initiatives to support the deployment of NextGen. I would like to highlight two of them.

In late 2008, the FAA announced a research contract award of $9.3 million to develop and conduct flight demonstrations for an ADS-B "In" application called Surface Indications and Alerts (or "SURF-IA"). The SURF-IA application is a priority of the FAA as it would address safety enhancements recommended by the National Transportation Safety Board (NTSB). This work was carried out successfully and identified specific technical areas that require additional attention from the FAA. The FAA shared the results of these projects with the ADS-B In Aviation Rulemaking Committee (ARC) which in turn endorsed a strategy to resolve any issues with this application so that it can be deployed. We believe this is an example of the FAA effectively leveraging timely research and working with industry for needed NextGen deployments. GAMA would encourage more targeted NextGen research of this type in the future.

Another ADS-B In application that will enhance safety in general aviation is called "Traffic Situational Awareness with Alerts" (TSAA) which would provide an evolved traffic collision avoidance system for light general aviation. As the subcommittee may know, the FAA has struggled to identify benefits for general aviation from ADS-B and funding to develop this general aviation ADS-B application is welcomed by GAMA. The TSAA contract has been awarded to MIT and the research plan is designed to develop the technical standards for the use of this application over the next three years.

Finally, we believe that NextGen research should benefit all segments of the aviation system. Although much work has been done to support key NextGen technologies like ADS-B, data communications, and System Wide Information Management, very little work has been done to evaluate human factors issues relative to the deployment of these technologies, especially for general aviation operations. We believe it is important for the FAA to continue to engage with our community through forums such as the Research, Engineering and Development Advisory Committee to help guide its future research activities for NextGen. We especially want to make sure that issues within general aviation, like single pilot operations, are not overlooked when technologies such as ADS-B and data communications are developed toward deployment.

Important Role of Centers of Excellence

The FAA has several Centers of Excellence (CoE) that were established by Congress to leverage academia in support of the FAA's research priorities. GAMA works closely

with the Center for General Aviation Research (CGAR), which is a consortium of leading aviation universities and flight schools including Embry-Riddle, Florida A&M, the University of North Dakota, the University of Alaska, and Wichita State University.

The CGAR consortium is celebrating its ten-year anniversary this year of supporting the FAA's research mission. Its successes include:

- The development, evaluation and establishment of training standards and testing standards for "glass cockpit" avionics in light general aviation.
- Use of Automatic Dependent Surveillance Broadcast (ADS-B) technology to track training flights.
- Evaluation of the use of data recorders in general aviation flight operations including flight schools such as Embry-Riddle.
- The development of Safety Management System (SMS) concepts for general aviation and how they fit within current regulations.
- Accident trend analysis for general aviation operations that is helping to guide the FAA's general aviation safety program, the General Aviation Joint Safety Committee (GAJSC).

192 graduate and undergraduate students have directly participated in these and other research projects sponsored by the FAA and CGAR. GAMA believes strongly in this type of foundational research and, more importantly, this research has a clear link to introducing new technologies or policies that have direct benefit to improving safety or capacity in our industry.

The House-passed FAA reauthorization bill included language to change the cost sharing criteria for FAA research projects. The bill placed the government share for Center of Excellence programs to be 50 percent of the total cost, but permitted the federal share to be increased to 75 percent if the Administrator determines that a center would be unable to carry out these activities without additional funds. Additionally, the measure would implement a reporting requirement to track the projects funding, institutions participating and their cost share, as well as the overall level of costshare. The feedback that GAMA has received from its members is that this new structure would further expand the ability of the program to support FAA's research mission through a shared cost structure. GAMA supports this change because of its ability to strengthen public/private research projects and would encourage its inclusion in a final FAA reauthorization.

Fostering Collaboration Between Industry and Academia

Given the current budget environment, never before has there been a more opportune time for universities and industry to collaborate. Aviation universities, like Embry-Riddle, should become greater resources in industry's research and study efforts. Successful collaboration gives industry access to quality research services as well as to potential future employees. In return, the university wins by offering students exposure to tremendous learning and networking opportunities.

I am referring to "course partnership," which gravitates around a regular university course (or set of courses) rather than a research project or program that requires grants and heavy research dollars. In these types of partnerships, students are expected to apply concepts and theory learned in class to the solution of some of the industry partner's key problems. Students benefit from the direct contact with the industry they are likely to join after they graduate as well as professional relationships they are able to establish during the course.

In these types of partnerships, industry benefits from a university program better tailored to its needs. Embry-Riddle and the aviation industry are primed and ready for more collaboration and course partnerships. There are numerous issues where undergraduate students could provide real value to some of the problems and areas industry and government have not yet had the resources to tackle.

Software Research

Lastly, we have frequently weighed in on the FAA's ability to certify and develop policy for software. In today's integrated cockpits, software is the cornerstone of new functionality which NextGen will require. We have championed this area over the past decade and within the research area have endorsed recommendations last spring about the software and digital systems program. Without new and streamlined paths to bring new and upgraded software into cockpits, the industry and the FAA risk delaying new innovations which will lead to increased safety and operational efficiency. These recommendations become even more critical, as the Committee knows, since the NextGen program makes onboard avionics part of the ATC infrastructure.

Industry has raised concerns through the REDAC that software and digital systems research and development be given additional emphasis by the FAA including staffing and funding. Specifically, the FAA must grow its software specialists with an eye towards new and innovative methods of software certification. Industry has also called for the FAA to develop comprehensive software and digital systems research plan that integrates with future policy and rulemaking needs.

The FAA took some steps during 2010 to develop a research plan, but concerns remain about the level of resources. GAMA is encouraged that the FAA is listening to industry with respect to our concerns about this important area of NextGen and wants to ensure that appropriate levels of funding are provided to maintain internal expertise and advance research in the area of software and digital systems. This also may be an area where universities like Embry-Riddle can provide to the FAA and industry needed specialists.

Conclusion

Mr. Chairman, the FAA's R&D and F&E programs are a critical part of the agency's mission and Congress must continue to provide it with the resources necessary to allow us to advance important initiatives outlined in my testimony. At the same time, we need to acknowledge the important role that the private sector, including industry and

academia, have in working collaboratively together and with government entities to advance mutual goals. GAMA stands ready to work with you and the other members of this Committee to meet these challenges and determine ways to work collectively to grow the aviation sector. Thank you for allowing me to testify.

Statement of
ALAN CASLAVKA
President, GE Aviation Systems - Avionics

Before the

Committee on Transportation and Infrastructure
U.S. House of Representatives

Hearing on

NextGen: Leveraging Public, Private and Academic Resources

Monday, November 7, 2011

Mr. Chairman, Members of the Committee, I am Alan Caslavka, President GE Aviation Systems - Avionics. Thank you for providing us this opportunity to present our views and observations to the Committee today.

INTRODUCTION

General Electric is making large investments to improve global infrastructure, whether that infrastructure is power generation, health delivery, rail facilities or aviation. In the aviation world, most people think of GE as a jet engine manufacturer. But we've broadened our horizons far beyond engines, and are focusing on efficiency of the broader aviation system around the world. We are fully engaged in trying to solve the toughest problems of Airspace and Air Traffic Management.

Let me give you an example why a company like GE thinks this makes sense. We invest billions of dollars in R&D to develop new engine technologies that bring meaningful improvements in fuel consumption and emissions reductions. Our customers spend countless billions buying and operating those engines. But the implementation cycle on these technologies is measured in decades, not years.

There is significant opportunity to provide these same kinds of efficiencies and benefits in a very short period of time by improving our airspace and ATM infrastructure. In the very short term, I'm convinced it is possible to use technologies we already have, and understand very well, to create significant benefits for aircraft operators, for the FAA, for airports and for the communities they serve.

We see a tremendous opportunity to fundamentally transform our airspace and air traffic management infrastructure, to safely accommodate traffic growth more efficiently, more reliably, and in a way that respects the environment and our communities.

PARTNERING FOR NEXTGEN ADVANCEMENT

GE Aviation Systems is currently involved with a number of NextGen programs with the FAA, some at Embry-Riddle Aeronautical University. We are optimistic about the model established at the Florida NextGen Test Bed – and are hopeful that by doing collaborative work with government and academia we will be able to accelerate the delivery of benefit to aviation operators. Collaboration also provides an opportunity to leverage federal tax dollars and grow their influence through matching requirements and other private sector contributions.

GE Aviation Systems is the Avionics member of the Integrated Airport Initiative, a consortium of industry and academic NextGen players, focused on joint demonstration of operational improvements important to advancing NextGen implementation. The NextGen Test Bed was created with Embry-Riddle to host collaborative demonstrations to bring together the combined NextGen capabilities of the consortium. Ongoing demonstrations focus on near- and mid-term National Airspace System (NAS) solutions that provide measurable benefits to operators. Working together, we can address airspace challenges including trajectory-

based operations, high density airports, reducing the impact of weather on operations, collaborative air traffic management, and integration of Unmanned Air Systems (UAS) in civil airspace.

The Integrated Airport Initiative values the government partnership with the FAA facilitated by Embry-Riddle and the Test Bed. Demonstration programs allow us to develop and refine operational concepts as well as validate the benefits that technologies can provide. These programs help quantify what the benefits will be to key stakeholders and often include live flights that lay the groundwork for transition into ongoing operations.

Here at Embry-Riddle, we are collaborating on a number of activities. One FAA funded project, referred to as Task G, is designed to leverage existing Flight Management System technology to validate trajectory based operations concepts. This project is taking advantage of capability that is already on many aircraft to better coordinate arrivals between the aircraft and air traffic controllers. Implementation will help aircraft fly more optimized, idle descents with more efficient, shorter paths in the terminal area while safely increasing airport capacity.

Another Test Bed project, Task E, is investigating application of NextGen technology and operations to expand UAS access to civil airspace. GE is investing to adapt existing NextGen systems in operation on thousands of commercial aircraft to enable UAS to operate more like commercial aircraft in the airspace. We look forward to working with our partners at the FAA, Embry Riddle, General Atomics, and Lockheed Martin to demonstrate flight of an MQ-9 Predator B UAS with a modified 737 Flight Management System digitally linked to air traffic control. These proof of concept flights will show the ability of an FMS equipped UAS to fly very precise paths even in loss of link contingencies, while giving air traffic controllers a high degree of confidence in the UAS intended path.

The Test Bed will also host a demonstration for another FAA program, Network Enabled Operations or NEO, later this month. Together with Boeing, Raytheon, Harris and AAI Corporation, we will demonstrate SWIM-based trajectory information exchange via the NEO environment. We will fly a Shadow UAS with our Flight Management System and stream trajectory data that precisely defines the aircraft's intended path to the STARS and CARTS air traffic control systems via the NEO network. This project will help evaluate the type of data and exchange mechanisms between UAS and ATC systems that can help air traffic controllers better coordinate with unmanned systems in the NAS to pave the way for expanded UAS access to the National Airspace.

The programs GE has been involved in at the Test Bed, though limited, have shown the value of collaborative R&D and the impact of an integrated demonstration center to showcase the combined NextGen capabilities of the FAA-Embry Riddle-industry team. The increasing involvement of the FAA in Test Bed activities is valuable not only to fund demonstrations, but to enable moving the technologies demonstrated closer to operational use in the NAS. We recommend that Test Bed projects be expanded beyond just demonstrations to include a forum for funded collaborative R&D programs for near and mid-term NextGen capabilities. We also recommend that other contemplated test beds for UAS and other airspace users be

connected to this and the other FAA NextGen test beds at the FAA William J. Hughes Technical Center in Atlantic City, New Jersey and the NTX facility in Fort Worth, Texas.

FAA-Industry collaboration is also happening elsewhere.

The UAS FAA & Industry Team (UFIT) Cooperative Research and Development Agreement (CRDA) has a project underway with the FAA William J. Hughes Technical Center. GE and AAI Corporation, in cooperation with the FAA and U.S. Army performed the first "proof of concept" flight demonstrations of an Unmanned Aircraft System (UAS) controlled with a modified GE FMS certified for use in commercial manned aircraft. These flights were conducted as part of the UFIT CRDA to demonstrate an approach for the safe integration of UAS into the NAS, including the assessment of NextGen Trajectory-Based Operations (TBO). The flights and associated simulations at the FAA William J. Hughes Technical Center showed significant improvements for trajectory-based UAS operations and provided data to support the FAA safety case for UAS operations. Technology derived from this collaborative research will also be folded back into the GE commercial FMS to support advanced capabilities.

Another example of ongoing FAA-industry collaboration is the FAA Continuous Lower Energy, Emissions and Noise Technology or CLEEN program. General Electric is strongly committed to development of environmentally friendly technologies as evidenced by our Ecomagination program. CLEEN is a unique form of public-private partnership where the FAA funds up to 50% of technology maturation for big impact green aircraft technologies, while allowing industry to retain rights to their proprietary technology. GE is leading a CLEEN team that includes AirDat and Alaska Airlines working with Lockheed Martin under a companion contract to mature and demonstrate NextGen technologies that reduce the environmental footprint of aviation. Our CLEEN project will mature new Flight Management Systems and ERAM technologies toward a technology readiness level of 6 or 7 with actual flight demonstrations in partnership with Alaska Airlines to measure the reductions in fuel, emissions, and noise for these advanced NextGen operations.

Opportunity for Future Partnerships

I'd like to take a moment to talk about the value of collaboration between FAA and the private sector in the deployment of NextGen economic and environmental benefits. In China, Australia, Canada and South America, GE has developed a great deal of experience and expertise over the last eight years working with airlines and air navigation service providers to deploy Performance-based Navigation aircraft paths -- specifically RNP paths. In collaboration with governments, regulatory agencies and airlines, we've designed and deployed more than 340 RNP instrument procedures in seven countries. Based on that experience, and on the experience of others, there is clear and compelling evidence that, PBN, implemented properly, can reduce aircraft track miles, fuel consumption and CO2 emissions.

Performance-based Navigation aircraft paths also provide maximum flexibility to design aircraft tracks that minimally impact the communities around airports. With the input and

engagement of all potential beneficiaries and stakeholders, PBN instrument procedures can provide nearly instantaneous NextGen benefits to airlines, FAA, airports and communities alike.

In the busiest, most congested airspace in the U.S., considerable work is still required to develop the air traffic management tools required for managing RNP in a dense-traffic, mixed equipage environment. FAA has several ongoing projects that address this issue. However, nothing prevents us from deploying beneficial RNP procedures at the majority of airports across the U.S. with less congestion.

A recent study, developed by GE PBN Services, shows that accelerated deployment of RNP instrument approach procedures at 46 commercial airports across the United States would provide considerable economic and environmental benefit as deployment occurs in the span of three years. Those benefits include an annual reduction of nearly 13 million gallons of jet fuel consumption and reductions in CO2 emissions of more than 274 million pounds a year. Moreover, airlines using the procedures would save an annual $65.6 million in operating costs, and more than 747 days in cumulative flight time per year, based on reduced track miles,

These kinds of near-term benefits align with a recent recommendation of the NextGen Advisory Committee to develop and deploy RNP instrument procedures that would allow currently equipped users to routinely fly them and achieve the associated benefits.

The quickest and most efficient way to deploy these procedures, we believe, is to engage qualified, commercial PBN service providers, like GE, to work with FAA to design and deploy them. The FAA Policy for this collaboration already exists within the existing regulatory framework, and work could begin immediately.

CONCLUSION

Collaborative research and development and public-private partnership are critical to deliver tangible benefits of NextGen to the operators who utilize our airspace. NextGen demonstrations need to be about getting the benefits of the technologies and operations into the hands of the airspace users faster and more smoothly. Adding focus on attracting commercial operators to participate in activities like the Test Bed will ensure that real-world operational realities are factored into the research and demonstration and build acceptance in the operator community. More of these programs that move the benefits of NextGen from the laboratory out into the actual airspace will speed the benefits for all users of the NAS. GE Aviation is proud to be part of the Integrated Airport Initiative and the Florida NextGen Test Bed. We look forward to working with the FAA, Embry-Riddle, and our industry partners to demonstrate real NextGen benefits for operational users of the NAS in the weeks and months to come.

United States Government Accountability Office

GAO

Testimony

Before the Committee on Transportation and Infrastructure, House of Representatives

For Release on Delivery
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NEXT GENERATION AIR TRANSPORTATION SYSTEM

Linking Test Facilities Can Help Leverage Resources and Improve Technology Transfer Efforts

Statement of Gerald L. Dillingham, Ph.D.
Director, Physical Infrastructure Issues

GAO-12-187T

Chairman Mica, Ranking Member Rahall, and Members of the Committee:

I appreciate the opportunity to testify before you today on the use of test facilities as a means of leveraging public, private, and academic resources to deliver technologies for the Next Generation Air Transportation System (NextGen). NextGen will affect nearly every aspect of air transportation and will transform the way in which the air transportation system operates today. It is a complex undertaking that requires new technologies—including new integrated ground and aircraft systems—as well as new procedures, processes, and supporting infrastructure. The result will be an air transportation system that relies on satellite-based surveillance and navigation, data communications, and improved collaborative decision making. Transforming the nation's air transportation system affects and involves the activities and missions of several federal agencies,[1] though the Federal Aviation Administration (FAA) is the lead implementer. In addition, NextGen was designed and planned to be developed in collaboration with aviation stakeholders—airlines and other airspace users, air traffic controllers, and avionics, aircraft, and automation systems manufacturers—in order to facilitate coordinated research activities, transfer technologies from FAA and partner agencies to the private sector, and take advantage of research and technology developed by the private sector that could meet NextGen needs, as appropriate. Three NextGen test facilities, collectively referred to as the NextGen Test Bed, are designed to foster the research and development of NextGen-related technologies and to evaluate integrated technologies and procedures for nationwide NextGen deployment. These test facilities provide access to the systems currently used in the national air space (NAS) and house various types of hardware, simulators, and other equipment to allow for demonstrations of new technologies. They also provide opportunities for stakeholders—public and private—to collaborate with FAA, academia, and each other.

My statement today discusses (1) the role of the NextGen test facilities in the development of NextGen technologies and how private industry and partner agencies participate in projects at the NextGen test facilities, and (2) our previous findings on NextGen technology transfer and FAA's

[1]Federal partner agencies include the Federal Aviation Administration; the Departments of Commerce, Defense and Homeland Security; and the National Aeronautics and Space Administration.

efforts to improve the transfer and implementation of NextGen-related technologies. This statement is based on our prior NextGen-related reports and testimonies,[2] updated with information we gathered from FAA and test facility officials in October 2011. The GAO reports cited in this statement contain more detailed explanations of the methods used to conduct our work, which we performed in accordance with generally accepted government auditing standards.

In summary, the role of the NextGen Test Bed is to demonstrate the benefits of NextGen initiatives and to do so early in the technology development process. While sharing a common purpose, each of the three facilities that collectively make up the NextGen Test Bed offers different testing capabilities and brings together different participants from different communities. Across the test facilities private and public sector stakeholders contribute personnel, equipment, and funding to develop and integrate technologies. Linking the test facilities to leverage the benefits of each is part of the NextGen Test Bed concept and officials from the test facilities indicated they have made some progress in doing so. In prior work on technology transfer activities, we found that the success of test facilities as a means to leverage private sector resources depends in large part on the extent to which the private sector perceives benefits to its participation. Similarly, collaboration among the NextGen partner agencies depends in part on their seeing outcomes that further their mission and on identifying a common purpose. FAA has taken a number of actions to improve its ability to implement new technologies and increase partner agencies' and private sector participants' involvement in seeing the development of selected technologies through to successful implementation—including restructuring the organization responsible for implementing NextGen and linking the test facilities and improving their capabilities.

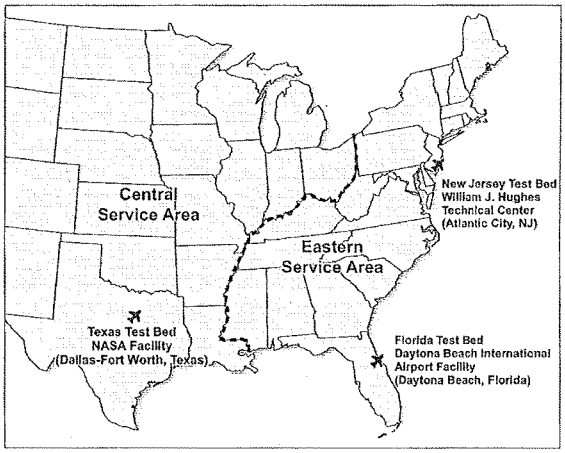
[2]GAO, *Next Generation Air Transportation System: FAA Has Made Progress in Implementation, but Delays Threaten to Impact Costs and Benefits*, GAO-12-141T (Washington, D.C.: Oct. 5, 2011); *Transportation System: Mechanisms for Collaboration and Technology Transfer Could be Enhanced to More Fully Leverage Partner Agency and Industry Resources*, GAO-11-604 (Washington, D.C.: June 30, 2011); *Integration of Current Implementation Efforts with Long-term Planning for the Next Generation Air Transportation System*, GAO-11-132R (Washington, D.C.: Nov. 22, 2010); *Next Generation Air Transportation System: Status of Systems Acquisition and the Transition to the Next Generation Air Transportation System*, GAO-08-1078 (Washington, D.C.: Sept. 11, 2008).

NextGen Test Facilities Share a Purpose but Have Different Capabilities and Participants

The purpose of the NextGen Test Bed is to provide an environment in which laboratory testing and real-world demonstrations help to show the benefits of NextGen technologies. Furthermore, the Test Bed provides access to the systems currently used in the NAS, which allows for testing and evaluating the integration and interoperability of new technologies. The Test Bed is also meant to bring together stakeholders early in the technology development process so participants can understand the benefits of operational improvements, identify potential risks and integration and interoperability issues, and foster partnerships between government and industry. Some test facilities also serve as a forum in which private companies can learn from and partner with each other and eventually enter into technology acquisition agreements with FAA with reduced risk.

Each of the NextGen test facilities that compose the NextGen Test Bed offers different testing capabilities and brings together different participants. The test facilities include: (1) the Florida Test Bed at Daytona Beach International Airport, supported by Embry-Riddle Aeronautical University (Embry-Riddle); (2) the Texas Test Bed, a National Aeronautics and Space Administration (NASA) facility near the Dallas-Fort Worth Airport; and (3) the New Jersey Test Bed located at FAA's William J. Hughes Technical Center near Atlantic City. (See fig. 1). According to FAA, while physically in different locations, the facilities are united in their purpose and will eventually be integrated to share capabilities and information.

Figure 1: Map of the Facilities That Compose the NextGen Test Bed



Sources: FAA and Map Resources.

While sharing a common purpose, each facility offers different testing capabilities and brings together different participants from different communities, as follows:

- The Florida Test Bed is located in a private facility at which companies, including Lockheed Martin and Boeing, come together with academia and FAA to test technologies that fit into the NextGen vision. Private participants contribute financially to research and demonstration projects and collaborate to test concepts and technologies. These activities are guided by memorandums of understanding among all the participants. Embry-Riddle is currently working on a model agreement to govern the contributions of its private partners that will help delineate which components (hardware, software, and infrastructure) will be provided by the government and which by private participants. The model is meant to provide a cost-sharing method and also help engage participants and provide a means for them to have a vested interest in seeing the development

of the technology all the way through to implementation. Currently, FAA pays the operating costs of the Florida Test Bed while Embry-Riddle and participating companies contribute technology and technical staff. Private participants may invest directly in software or hardware support. The facility—which has just undergone an expansion—provides access to the systems currently used in the NAS and to some of the major navigation, surveillance, communications, and weather information programs that are under development. It also has a dedicated area to support demonstrations and a separate space for the participating companies to test integration—where a greater contribution from the private sector is envisioned.

- The Texas Test Bed is a collaborative effort between NASA and FAA built on the grounds of FAA's Fort Worth Air Route Traffic Control Center. It supports NextGen research through field evaluations, shadow testing, the evaluation of simulations, and data collection and analysis.[3] The researchers at the facility have agreements to receive data feeds from the airlines operating at the Dallas-Fort Worth airport, as well as various data feeds from airport and air traffic control facilities.

- The New Jersey Test Bed, located at FAA's national scientific test base, conducts research and development for new NextGen systems. In June 2010, this facility opened the NextGen Integration and Evaluation Capability area where scientists use real-time simulation to explore, integrate, and evaluate NextGen concepts, such as area navigation, trajectory-based operations, and unmanned aircraft system operations in the NAS. In addition, in 2008, FAA entered into a lease to build the Next Generation Research and Technology Park (the Park) adjacent to the New Jersey Test Bed. The Park is a partnership intended to engage industry in a broad spectrum of research projects, with access to state-of-the-art federal laboratories. The Park's establishment is meant to encourage the transfer of scientific and technical information, data, and know-how to and from the private sector and is consistent with FAA's technology transfer goals. (See table 1 for examples of past and planned activities at NextGen test facilities.)

[3]Field evaluations include tests or trials in an operational (i.e. field) environment, as opposed to a laboratory setting. Shadow testing refers to evaluating a concept or technology using live data rather than simulated or recorded data. It can be performed in a laboratory or in the field.

Table 1: Select Projects at NextGen Test Facilities

Facility	Project	Description	Purpose	Participants
Florida Test Bed	Flight Data Object (FDO) Preparation	A flight's unique characteristics, data elements collected from disparate sources and merged into a cohesive picture, are its "Flight Object." Identifying these characteristics throughout the phases of flight in domestic and international automation systems is part of the process of developing four-dimensional trajectory planning that considers both space and time.	Perform research, analysis, and demonstration of Flight Data Object exchange as a means for capturing and sharing up-to-date information on any flight.	Lockheed Martin, Harris Corporation, Sensis Corporation, Mosaic ATM, Adacel, NavPortugal, NATS UK, and Embry-Riddle
	4-Dimensional Weather Cube Demonstration	The 4-Dimensional Weather Cube is continuously updated information on weather conditions, including convection, turbulence, icing, wind, visibility, clouds, volcanic ash, and space weather. The information is suitable for use by human or machine aviation decision-making procedures and processes.	Small demonstration of the 4-Dimensional weather cube.	Massachusetts Institute of Technology Lincoln Laboratory, NCAR, Embry-Riddle
	Oceanic Conflict Advisory Trial (OCAT) Flight Trial	OCAT is a year-long FAA operational trial designed to help airlines fly more of their preferred oceanic routings while reducing air traffic controller and pilot workloads.	Trial to allow airlines to access Advanced Technologies and Oceanic Procedures (ATOP) conflict probe results. ATOP is an integrated oceanic air traffic control automation system that includes an enhanced probe to detect conflicts between aircraft.	Lockheed Martin, Boeing, Embry-Riddle
Texas Test Bed	Precision Departure Release Capability (PDRC)	PDRC is software that links Traffic Management Advisor to other information to better plan flight departures by minimizing delays once passengers have boarded. Traffic Management Advisor uses graphical displays and alerts to increase situational awareness for air traffic controllers and traffic management coordinators.	Live-data, engineering shadow evaluation to verify integrated performance, refine concept of operations, and develop plan for operational evaluation.	NASA, FAA

Facility	Project	Description	Purpose	Participants
	Boeing Direct Routes	Boeing Direct Routes is a service that uses advanced software algorithms developed by NASA to automatically alert an airline's operations centers and flight crew when a simple, more fuel-efficient path is available, permitting the operations center to propose those routes to FAA controllers for approval.	Evaluate the performance and operational utility of decision support tool for air carrier use.	NASA, FAA, Boeing, Southwest Airlines, Continental Airlines
New Jersey Test Bed	Conflict Resolution Advisories Demonstration Project	Conflict Resolution Advisories is meant to ease en route controller workload and eliminate controller tasks associated with determining conflict resolution. Instead of the controller monitoring the sector airspace display to predict potential problems and mentally calculate problem resolutions, the technology will predict the problem and determine the best solution.	A series of experiments will assess the utility and operational acceptability of the automated resolutions proposed. The experiments will also provide data for the benefits and safety assessments of the operational improvement.	MITRE-Center for Advanced Aviation System Development, FAA
	D-AIRWOLF: DataComm Weather Demonstration	The Automatic Identification of Risk Weather Objects in Line of Flight (AIRWOLF) is a support tool that detects conflicts between aircraft and hazardous weather, alerts the controller, and generates automatic weather advisories. Data Communications (DataComm) is the first phase in the transition from the current analog voice systems to digital communication.	Simulation examines the combination of DataComm and the AIRWOLF weather advisory. Purpose is a demonstration of automated weather advisories being sent from the controller workstation to the pilot over a DataComm interface.	FAA

Source: GAO analysis of FAA and NASA information.

According to officials from the test facilities, they have made some progress in their plans to link the NextGen test facilities to integrate capabilities and share information. Linking the test facilities to leverage the benefits of each is part of the NextGen Test Bed concept. According to an FAA official, in June 2011, the Florida and New Jersey Test Beds established data integration capabilities when they were connected with FAA's NextGen Research and Development computer network. During the summer, they used the integrated capabilities to participate in a demonstration of the Oceanic Conflict Advisory Trial (OCAT) system.[4] In

[4]OCAT is a year-long FAA operational trial designed to help airlines fly more of their preferred oceanic routings while reducing air traffic controller and pilot workloads.

addition, the Texas Test Bed is in the final stages of being connected to FAA's NextGen Research and Development computer network. According to officials at the Texas Test Bed, in the past year, FAA and NASA collaborated on a NextGen Test Bed capabilities analysis and developed an interagency agreement to support NextGen Test Bed collaboration. This increased level of coordination is expected to continue.

Stakeholders Must See Tangible Results to Participate in NextGen Technology Development, and FAA Has Taken Steps to Improve Technology Transfer and Implementation

In prior work on technology transfer activities, we found that the success of test facilities as a means to leverage private sector resources depends in large part on the extent to which the private sector perceives benefits to its participation.[5] Representatives of firms participating in test facility activities told us that tangible results—that is, the implementation of technologies they helped to develop—were important to maintain the private sector's interest. However, they said it was not always clear what happened to technologies that were successfully tested at these sites. In some cases, it was not apparent whether the technology being tested had a clear path to implementation, or whether that technology had a clear place in FAA's NAS Enterprise Architecture Infrastructure Roadmaps.[6] As a result, a successfully tested technology would not move to implementation in the NAS. We also found that FAA has had difficulty advancing technologies that cut across programs and offices at FAA, when there is no clear "home" or "champion" within FAA for the technology.

FAA's expansion of the Test Bed concept—linking together its testing facilities, expanding the Florida Test Bed, and building a Research and Technology Park adjacent to the New Jersey Test Bed to complement the capabilities at Embry-Riddle—is a positive step that should help to address some of these issues, allowing private sector participants to remain more involved throughout the process, with a vested interest in seeing the development of selected technologies through to successful implementation. In addition, to improve its ability to implement new technologies, FAA has begun to restructure its Air Traffic Organization (ATO), which is responsible for moving air traffic safely and efficiently, as well as for implementing NextGen. We have previously reported on problems with FAA's management structure and oversight of NextGen

[5]GAO-11-604.

[6]NAS Enterprise Architecture Infrastructure Roadmaps describe the strategy for transitioning from the current NAS to the future NAS environment.

acquisitions and implementation and made recommendations designed to improve FAA's ability to manage portfolios of capabilities across program offices. To address these issues, FAA made the Deputy Administrator responsible for the NextGen organization and created a new head of program management for NextGen-related programs to ensure improved oversight of NextGen implementation. Furthermore, the ATO is in the process of being divided into two branches: operations and NextGen program management. Operations will focus on the day-to-day management of the NAS and the program management branch will be responsible for developing and implementing programs while working with operations to ensure proper integration. While a focus on accountability for NextGen implementation is a positive step and can help address issues with respect to finding the right "home" for technologies and creating a clearer path to implementation, it is too early to tell whether this reorganization will produce the desired results.

Collaboration among the NextGen partner agencies also depends, in part, on their perceiving positive outcomes. NASA has historically been FAA's primary source of long-term air traffic management research and continues to lead research and development activities for many key elements of NextGen. However, past technology transfer efforts between NASA and FAA faced challenges at the transfer point between invention and acquisition, referred to as the "valley of death." At this point in the process, NASA has limited funding at times to continue beyond fundamental research, but the technology was not matured to a level for FAA to assume the risks of investing in a technology that had not yet been demonstrated with a prototype or similar evidence. FAA and NASA officials are both working to address this issue through interagency agreements that specify a commitment to a more advanced level of technological maturity of research that NASA has conducted in the past. Using an interagency agreement, as well as test facility demonstrations, NASA developed and successfully transferred the Traffic Management Advisor—a program that uses graphical displays and alerts to increase situational awareness for air traffic controllers and traffic management coordinators—to FAA. Through the agreement, the two agencies established the necessary data feeds and two-way computer interfaces to support the program. NASA demonstrated the system's capabilities at the Texas Test Bed, where it also conducted operational evaluations and transferred the program to FAA, which, after reengineering it for operational use, deployed it throughout the United States.

FAA has also used research transition teams to coordinate research and transfer technologies from NASA and overcome technology transfer

challenges.[7] As we have previously reported, the design of these teams is consistent with several key practices of interagency coordination we have identified.[8] These teams identify common outcomes, establish a joint strategy to achieve that outcome, and define each agency's role and responsibilities, allowing FAA and NASA to overcome differences in agency missions, cultures, and established ways of doing business.

Differences in mission priorities, however, particularly between FAA and the Department of Homeland Security (DHS), and between FAA and the Department of Defense (DOD), pose a challenge to coordination with those agencies. DHS's diverse set of mission priorities, ranging from aviation security to border protection, affects its level of involvement in NextGen activities. Agency officials also have stated that although different offices within DHS are involved in related NextGen activities, such as security issues, the fact that NextGen implementation is not a formalized mission in DHS can affect its level of participation in NextGen activities. NextGen stakeholders reported that FAA could more effectively engage partner agencies in long-term planning by aligning implementation activities to agency mission priorities and by obtaining agency buy-in for actions required to transform the NAS.

In addition, we have reported that FAA's mechanisms for collaborating on research and technology development efforts with DOD and DHS do not ensure that resources are fully leveraged. For example, FAA and DOD have yet to fully identify what DOD research, technology, or expertise could support NextGen activities. DOD has not completed an inventory of its research and development portfolio related to NextGen, impeding FAA's ability to identify and leverage potentially useful research, technology, or expertise from DOD. In addition, DHS's collaboration with FAA and its NextGen planning unit, the Joint Planning and Development Office has been limited in certain areas of NextGen research, and the agencies have yet to fully determine what can be leveraged. Lack of

[7]Research transition teams cover approximately half of all research and development activities conducted by NASA's Airspace Systems Program—a group assigned to directly address fundamental NextGen needs. Each team addresses a specific issue area that (1) is considered a high priority, (2) has defined projects and deliverables, and (3) requires the coordination of multiple offices within FAA or NASA.

[8]GAO-11-604. See also GAO, *Results Oriented Government: Practices That Can Enhance and Sustain Collaboration among Federal Agencies*, GAO-06-15 (Washington, D.C.: Oct. 21, 2005).

coordination between FAA and DOD and FAA and DHS could result in duplicative research and inefficient use of resources at both agencies. We previously recommended that these agencies develop mechanisms to further clarify NextGen interagency collaborative priorities and enhance technology transfer between the agencies.

Chairman Mica, Ranking Member Rahall, and Members of the Committee, this concludes my prepared statement. I would be pleased to answer any questions that you may have at this time.

GAO Contact and Staff Acknowledgments

For further information on this testimony, please contact Gerald L. Dillingham, Ph.D., at (202) 512-2834 or dillinghamg@gao.gov. In addition, contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. Individuals making key contributions to this testimony include Andrew Von Ah (Assistant Director), Kevin Egan, Elizabeth Eisenstadt, Richard Hung, Bert Japikse, Kieran McCarthy, and Jessica Wintfeld.

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Testimony to the U.S. House of Representatives
Committee on Transportation and Infrastructure
November 7, 2011

John P. Johnson, Ph.D.
President, Embry-Riddle Aeronautical University

Embry-Riddle Aeronautical University (ERAU) is a unique institution. We are rated as best in class in a number of disciplines. Our programs in aviation sciences, aerospace engineering, and engineering and space physics are among the largest and best in the world. We are known for our applied research that focuses on finding solutions to real world problems in aviation. With outstanding colleges of aviation and engineering and a fleet of 100 small airplanes we are able to quickly identify problems, design research strategies, and test them. Ongoing research projects in NextGen technology, unmanned aircraft systems, safety, advanced propulsion, biofuels, and the development of eco-friendly hybrid cars and planes are a few examples.

ERAU has a long history of working to make our skies safer and our air traffic management system more efficient. Beginning in 2003 we equipped our entire fleet with satellite-based GPS technology (ADS-B). This addition to our avionics package allowed our instructors and student pilots to pinpoint their exact locations with greater accuracy and to see other airplanes in their air space. Our testing of the system over the past eight years has repeatedly demonstrated that planes equipped with this technology are safer. The pilot's ability to locate and visualize other aircraft in their airspace and identify altitude, direction, and closing speed allows them to work with Air Traffic Control to make adjustments in their flight pattern and maintain separation. This is one of the major components of NextGen research.

Satellite-based technology is faster and more accurate than our current ground based radar system. It allows better communications, is not subject to limitations due to terrain variations, can provide more accurate and timely information about storms and changes in weather patterns. It essentially provides real-time information, allowing planes to safely fly closer together. The increased precision will serve to reduce bandwidth and increase capacity. This will result in greater operational efficiency and should help to prevent airport delays. We are projecting a 35% reduction in ground and flight delays by 2018 as we phase in the technology. The increase in precision and air traffic control over mountainess terrain will also allow more direct flights. This should serve to reduce travel time, make flying safer and save fuel. Planes should also be able to take off without as much delay and will spend less time in holding patterns. More direct routes and less time sitting on the tarmac or circling the airport should result in a lessening of carbon dioxide emissions.

Our current radar system is dated. It was widely deployed in the 1950's when air traffic was a small fraction of what it is today. There have not been any significant changes to that system over the past half century. Existing technologies can be integrated and applied to make our skies safer, our airports more secure, and our airlines more efficient. Embry-Riddle is pleased to be able to partner with the FAA and our leading aerospace companies to develop new software and explore ways to integrate technology in a manner that better serves our industry and the flying public. We feel that the Florida NextGen Test Bed is making great progress and offers opportunities to strengthen our air transportation system.

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